AUTOMOTIVE INDUSTRIES

A CHILTON PUBLICATION

MARCH 1, 1959

Features • • •

Automotive Uses for Decorative Metals

Producing Redstone and Jupiter Missiles

Details of Ford's New Tractor Transmission

Many Operations in Manufacturing Carburetors

Special Setup for Automatic Heat Treating

Red China's Expanding Automobile Industry

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Automotive and Aviation Manufacturing
ENGINEERING • PRODUCTION • MANAGEMENT

Gets 40% savings in coolant costs by change to

Standard's Transparent Coolant

ARGON Oil No. 4

Chicago Saws, Inc., realizes other benefits in switch to this Standard Oil product

Situation: It all started when a Standard Oil lubrication specialist recommended ARGON Oil No. 4, Standard's transparent coolant to Chicago Saws for use in their grinding operations. This manufacturer of rotary saw blades decided to give it a try. They knew the product was the result of more than three years' work in Standard's research laboratory, and that it had been extensively field tested.

What happened: Using Argon Oil No. 4 in 100:1 concentration, Chicago Saws was able to reduce coolant costs 40%. They also found the work could be seen more clearly when using this coolant. There was less wheel loading. They also discovered the coolant didn't foam and that its exceptional ability to carry off heat re-sulted in cooler operation. Faster cuts were obtained with finer wheels. Tolerances were easier to hold. Better finishes were obtained. Less frequent wheel dressings were required.

What you can do: Get more information about Argon Oil No. 4 transparent coolant. Call the Standard Oil lubrication specialist near you in any of the 15 Midwest or Rocky Mountain states. Or write: Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

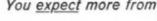


Using ARGON Oil No. 4, Chicago Saws gets better finish at savings of 40% over other coolants tried. Operator is using .004" cut on heat treated Rockwell 60 C steel.

You expect more from STANDARD



and you get it!



Quick facts about Standard's **Transparent Coolant** ARGON OII No. 4

- · Clear, transparent fluid
- · All chemical. Does not support bacteria growth
- · Unaffected by humidity
- Nonfoaming
- · Fire resistant

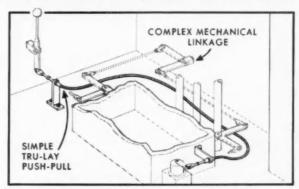


Standard's Bob Stark and Chicago Saws' vice president Paul Bostrom discuss blades and coolants. Bob Stark is well qualified to work with manufacturers on the use of metalworking coolants. Bob has a chemistry degree from Illinois College plus three years' experience at Standard. He has completed the Standard Oil Sales Engineering School course.

Circle 101 on Inquiry Card, for more Data

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Design Engineers Report on Benefits

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"We get minimum backlash because the cable is designed to close tolerances with minimum drag and lost motion."

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Push-Pull controls are solid as a rod and flexible as a wire rope. You can use them in the electrical, hydraulic, and pneumatic systems on construction equipment, on farm implements...almost anywhere convenient remote control is desired. For complete details on how you can use them, write for a copy of the Push-Pull Data File. It contains 7 bulletins which describe in detail the operation of Push-Pulls, their applications, features, and advantages. Our engineers will be glad to help you make Tru-Lay Push-Pull controls a part of your product.

Automotive and Aircraft Division

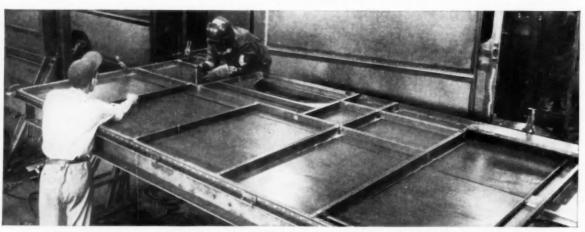
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AUTOMOTIVE INDUSTRIES

CHILTON MAGAZINE . PUBLISHED SEMI-MONTHLY

MARCH 1, 1959

VOL. 120 No. 5

Features •

Carburetor Production at Rochester

The manufacture of carburetors is a complex operation. The techniques involved are very diversified. Page 20.

Ford's 10-Speed Tractor Transmission

Completely controlled by one lever, this new transmission has several interesting design features. Page 25.

Redstone and Jupiter Missile Production

Its automotive experience has been invaluable to Chrysler in missile production. Presented here is a tour of facilities that are unique. Page 26.

Decorative Metals for Automotive Styling

Expanded, textured and perforated metals offer many possibilities to the designer. Here is a survey of present and potential uses. Page 28.

ASLE Gear Lubrication Symposium

Many automotive lubrication problems were discussed at this meeting. Page 34.

Plastic Foam Insulation in Trailers

Complete insulation of a test trailer with Lockfoam proves out well. Page 35.

Red China's Automobile Industry

Vehicle production is surging ahead in Communist China. This report shows latest developments in the field. Page 36.

Automated Heat Treating at Harnischfeger

Required flexibility is provided in this straight line setup. See Page 37.

SPI Reinforced Plastics Conference

The transportation and aircraft industries are gobbling up reinforced plastics at a steadily increasing rate. Page 38.

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MEMBER=

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Audit Bureau of Circulations AUTOMOTIVE INDUSTRIES is a consolidation of The Automobile (weekly) and the Motor Review (weekly: May, 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.

EDITORIAL EXECUTIVE OFFICES, Chestnut and 56th Sts., Philadelphia 39, Pa., U. S. A. Cable address—Autoland, Philadelphia

AUTOMOTIVE INDUSTRIES. Published semi-monthly by Chilton Company, Chestnut & 56th Sts., Phila 39. Second Class Postage Paid at Philadelphia, Pa.; Under the Act of Congress of March 3, 1879. Subscription price: To manufacturers in and suppliers to the automotive industries in the U. S., U. S. Possessions and Canada, \$2.00 per year; \$3.00 for 2 years. All Others, \$10.00 per year. Single copies, 50c. Statistical Issue, \$1.00.

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▼ Austrian Version of Fiat 500.

A new engine, transmission, and rear suspension are used in the Austrian model of the Italian Fiat. Page 39.

▼ 39 New Product Items, And Other Features, Such As:

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CALENDAR

OF COMING SHOWS AND MEETINGS

- World Wide Auto Show, Miami Beach Exhibition Hall, Miami Beach, Fla. Feb. 27-Mar. 8
- Ninth Annual National Autorama, Connecticut State Armory, Hartford, Conn.Mar. 4-8
- Western Space Age Conference and Exhibit, Great Western Exhibit Center, Los Angeles, Calif...Mar. 5-7
- ASME Gas Turbine Conference and Exposition, Netherland Hilton Hotel, Cincinnati, O.Mar. 8-11
- Steel Founders' Society of America, 58th annual meeting, Drake Hotel, Chicago, III.Mar. 9-10
- ASME Aviation Division Conference, Statler-Hilton Hotel, Los Angeles, Calif. Mar. 9-12
- National Association of Manufacturers Institute on Industrial Relations, Hollywood Beach Hotel, Hollywood, Fla. Mar. 9-13
- Ninth Annual Iron & Steel Conference, sponsored by Pittsburgh Section of Instrument Society of America, Pick-Roosevelt Hotel, Pittsburgh, Pa. Mar. 11-12
- Pressed Metal Institute Spring Technical Meeting, Pick-Congress Hotel, Chicago, III... Mar. 11-13
- International Geneva Motor Show, Geneva, Switzerland Mar. 12-22
- Eleventh Western Metal Exposition and Congress, Pan-Pacific Auditorium and Ambassador Hotel, Los Angeles, Calif. Mar. 16-20
- Manufacturing Chemists' Association Conference, Netherlands Hilton Hotel, Cincinnati, O. Mar. 18-
- Institute of Aeronautical Sciences, Flight Propulsion Meeting (classified), Hotel Carter, Cleveland, O. Mar. 19-2



The DOUBLE IMPACT... of a UDYLITE IDEA

Project Alert, as a philosophy of re-awakening, of renewed enthusiasm, of mental alertness, has shown wonderful results since its initiation last fall. Many organizations have asked us for supplies of Project Alert folders and buttons so that they may introduce it to their people. Leading magazines and newspapers, too, have given Project Alert splendid support.

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2. Adoption of the philosophy to your own organization will help you as surely as it has helped others. And keeping your eye on Udylite product presentations and their sincere true value offerings can only add to your profits.

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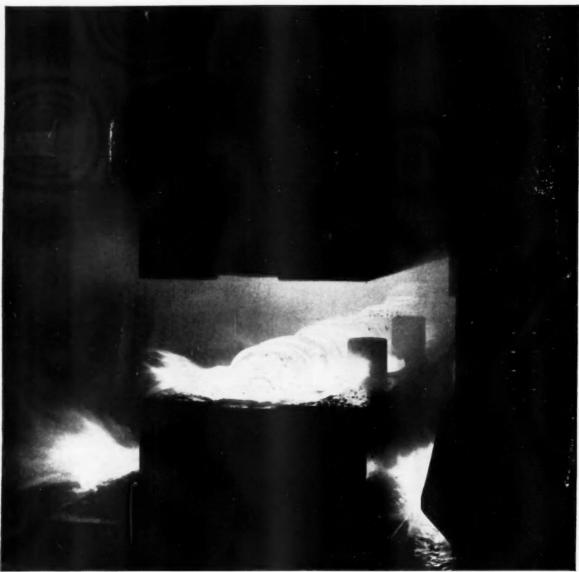


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News

OF THE AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 120, No. 5

March 1, 1959

Small Car Plans As We Go To Press

GENERAL MOTORS—September production, October Introduction, 108 in. wheelbase cars for Chevrolet. Engines at Tonawanda, 80 an hour. Assembly split 950 a day at Willow Run, 190 at Van Nuys, possible use Kansas City later.

Rear-mounted six-cylinder flat engine, aircooled, high silicon aluminum block, 141 in. displacement, 92 hp. Slightly larger BOP car on separate shell being readied for 1961 model year, but no decision yet.

FORD MOTOR CO.—October production, November-December introduction, 109 in. wheelbase car for Ford Div. Engines at Lima, some castings at Rouge foundry. Scheduling 980 cars a day, split 780 at Lorain, 200 at San Jose, possible use Kansas City later, at about 110 a day.

Unitized construction, no frame, like Lincoln and T-Bird. Two-and four-door sedans, later on a two-door station wagon. Front mounted six-cylinder OHV in-line engine, new cast iron block, 144.3 cu in. displacement, 3.5 x 2.5, 86 hp. Also preparing Edsel "B" 114 in. wheelbase car for MEL distribution year later; would use same block, larger displacement. Decision on Edsel B will come later.

CHRYSLER CORP.—December-January production for early 1960 introduction, 106 in. wheelbase car for Plymouth and Dodge. Engine cast in Kokomo, built up in Trenton on new line. Car assembly at Dodge main plant, Hamtramck.

Front mounted six-cylinder OHV in-line engine, aluminum block with cast iron wet sleeve; may use high silicon aluminum sleeve later in year. Engine displacement 170 cu in., 3.4 x 3.125, 90-100 hp four-door sedan, possible station wagon. Only one car in planning, although Dodge



M.G. MAGNETTE MARK III HAS PININ FARINA BODY

M. G. Magnette Mark III is another variation on the Pinin Farina body now being introduced by British Motor Corp. for a number of restyled models in its range. The traditional radiator grille is flared into the nose of the Italian-designed body. The standard 91.5-cu in. engine has twin S. U. carburetors and delivers 68 bhp at 5400 rpm, driving through a four-speed transmission with floor shift.

may offer separate shorter than standard car as part of regular 1960 line.

Willys-Overland Signs New Assembly Plant in Holland

Willys-Overland Export Corp. has signed a Dutch firm to assemble and distribute Jeep vehicles in The Netherlands and selected re-export markets. The company, Kemper en van Twist of Dordecht, also will set up a Jeep parts and service depot for the Dutch Army.

De Soto Slates Production Of Spring Model, "Seville"

De Soto Div. has scheduled early March production of a new Spring Model, the "Seville." The new model is being introduced in honor of the division's 30th anniversary—and as a spring tonic for De Soto sales.

The Seville will be offered as a twoand four-door hardtop in the Firesweep and Firedome series. Standard equipment will include special side molding, padded instrument panel, plaid interior trim and special steering wheel

The car is named for the Spanish city where explorer Hernando De Soto began his expedition to the New World.

GM Develops New Material With Properties of Steel

General Motors has developed a new steel-like material with strength, castability and machinability equal to or better than steel. The material, called CentraSteel, has a 28 million psi elastic modulus, called superior to cast iron and close to steel.

CentraSteel was developed jointly by Central Foundry Div. and GM Research Laboratories. The material is produced by adding boron and tellurium to a low carbon, high silicon base composition.

NEWS AND AVIATION



New GMC transit bus features modern styling

GMC Will Build Glamour Into New Line of Buses

GMC Truck and Coach Div. will accent glamour and passenger comfort in its new line of city buses, slated for initial production during the fourth quarter of 1959.

The new busses will feature 93 per cent more glass area than in former models, with picture windows for the passengers and windshield nearly three times the previous area.

Fluorescent white light, Melamine panels and anodized aluminum with the appearance of leather will highlight the interiors. Optional air conditioning can be integrated with the standard heating and ventilating system.

Four models will be available: two 45-passenger models at 96 and 102 in. widths, and two 53-passenger models at the same widths.

The buses will be powered by 190 hp V-6 diesel engines, announced earlier this year by Detroit Diesel Div.

Chrysler Calls Back Workers As Glass Strike Is Settled

Chrysler Corp. called back idle workers and scheduled full production at all assembly plants with settlement of the 134-day strike at Pittsburgh Plate Glass Co.

At one time, 20,000 Chrysler production workers were laid off because of the glass shortage. Only Dodge truck and Imperial were unaffected. Later, Chrysler began receiving glass from other sources and scheduled

partial production at other car assembly plants.

By mid-February, Chrysler had built only 57,845 cars, well below last year's total of nearly 81,000 at the same make. But the company expects a good production month in March to fill dealer and customer order backlogs.

American Motors also was slowed down by the marathon Pittsburgh glass strike, but AMC found an alternate source earlier and consequently did not have to shut down completely.

Ford Motor Co. increased its own glass output when supplies from Pittsburgh were cut off, and by February Ford was supplying both AMC and Chrysler.

By mid-February, the industry was running about 28 per cent ahead of last year, despite the Chrysler cutback. Every other company was well ahead of the 1958 pace. One Chrysler division—Dodge—was 1400 passenger cars ahead of 1958 with truck production nearly doubled.

Studebaker-Packard Corp. turned out nearly six times more cars during the first six weeks of 1959 than last year, with a total of 23,431. Early in February, the company had produced more 1959 model Larks than the total for both Studebaker and Packard cars during the entire 1958 model year.

Although General Motors had a total production gain of nearly 20,000 cars, several GM divisions showed disappointing figures. Only Cadillac and Pontiac could be termed encouraging.

Oldsmobile and Buick both showed

production decreases, and the Chevrolet margin over 1958 was less than 4000 cars.

Pontiac production, however, jumped from 45,628 a year ago to 58,008 through mid-month. And Pontiac reported a 27.6 per cent sales increase for the month of January, with 30,145 new car deliveries.

Edsel, a definite disappointment during 1958, is off to a better start this year. Production is up from 2472 units to 8267. And sales during the first 10 days of February were 10 per cent higher, according to marketing manager Leo Beebe.

Meanwhile, automobile dealers across the country are preparing for an all-out sales campaign in April patterned after last year's "You Auto Buy" weeks. This year's slogan is "You live better by far with a brand new car."

New GMC Bus Transmission Has Overdrive in Four Speeds

A new transmission developed by GMC Truck & Coach Div. for intercity buses offers overdrive in all four forward speeds.

According to Philip J. Monaghan, General Motors vice president and GMC general manager, the transmission, called Hydrashift, provides both direct drive and overdrive in each gear, with shifting under full power without declutching. A two-plate main clutch replaces conventional clutch, and there are no coil springs and release levers as in other clutches, says Monaghan.

For split-shifting, a button is pushed on the gear shift lever. This actuates hydraulic pressure which alternately engages or disengages each of two clutch systems.

Monaghan says the increased number of speeds provides faster acceleration and better gradeability than standard transmissions.

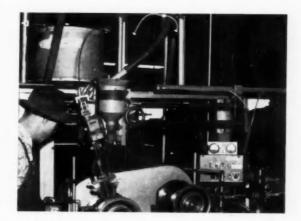
GMC is planning an initial production rate of 40 per cent Hydrashift on its coach model PD-4104.

Massey-Ferguson 1959 Line Features New '85' Tractor

The new M-F 85 five-plow tractor, designed for big acreage farms, highlights the 1959 Massey-Ferguson farm implement line introduced Feb. 20 in Detroit.

The 85, largest tractor equipped with the "Ferguson system," features a new transmission with eight forward and two reverse speeds. The 85 is available in four models.

Massey-Ferguson brought 4500dealers and salesmen to Detroit from



TRACTOR

Tractor rallers designed as a two-part forging by Wes Trac Co. engineers are welded by Linde Co.'s automatic Unionmelt welding process. This two-place fixture uses a Unionmelt EH-2 welding head which is moved from one station to the other by a hydraulic cylinder at the end of each cycle.

car for less than \$1000 to compete with used domestic automobiles.

Richards says the right kind of car in that category could sell between 40,000 and 50,000 units a year.

Gamble-Skogmo, hardware chain concentrating on small towns, at one time was close to an agreement to sell the Borgward Isabella. No agreement has been announced, however, with Borgward or any other manufacturer.

Rental Fleets Choosing More Convertibles, Chevrolet Finds

Rental fleets are leaning more toward convertibles, particularly in the South, according to early orders from Chevrolet. The number of Corvettes in the rental business also is climbing.

Chevrolet says its fleet orders for delivery during the first three months totaled approximately 59,000 cars, compared with some 100,000 during all of 1958. But, despite the upsurge of the convertible and sports car, the favorite model for the traveling salesman still is a four-door hardtop equipped with V-8 engine, automatic transmission, radio and heater.

General Tire Plans to Build \$8 Million Plant in Kentucky

General Tire & Rubber Co. plans to break ground this month for an \$8 million tire manufacturing plant at Mayfield, Ky. The company plans to begin manufacturing at the 400,000 sq ft plant within 14 months. The one-story continuous-flow plant will be General's third tire plant in the U. S.

every state, Canada and 11 other foreign countries. The two-day convention included 120 exhibits of tractors, farm implements and industrial equipment.

The M-F 85 is powered by a fourcylinder, 223-cu in. engine with belt hp of 60 and drawbar hp of 52. Diesel power is optional. Forward speeds range from 1.11 mph to 18.76 mph, with standard tires. Power steering is standard.

The new tractor is available in four models: standard clearance with adjustable tread, high clearance with adjustable tread, high clearance tricycle and high clearance single front wheel. Rear wheel tread can be power adjusted as much as 26 in.

The Ferguson system, which automatically controls depth of plows and similar implements, transfers weight to the power wheels of the 85 to provide maximum traction.

New Suspension System Joins Air Bellows and Leaf Springs

Leyland Motors Ltd. of England has developed an experimental suspension system for buses that combines air bellows and leaf springs.

The steel semi-elliptics support 90 per cent of the unladen weight, according to Leyland, and provide longitudinal and lateral location of the axle. Both the leaf and bellows springs absorb torque reaction in either direction.

Two double-convolution bellows at each end of the rear axle are sandwiched between a bracket hung from the frame side member and an inverted U-type beam mounted on the top side of the axle housing tube.

Two leveling valves, linked to the axle by short control rods, maintain a constant chassis height regardless of load. A time lag mechanism prevents the valves from being affected by temporary height variations caused by road undulations.

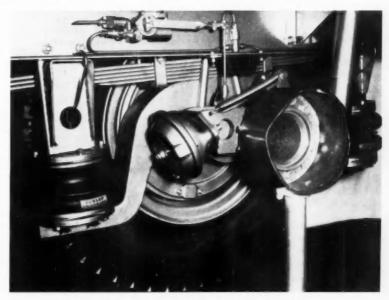
Chain Stores Plan to Enter Automobile Retail Market

Two large retail store chains are planning to enter the automobile business, offering small imported passenger cars through their outlets.

Both Montgomery Ward and Co. and Gamble-Skogmo have been negotiating with European manufacturers, but so far no agreements have been reached.

Ward's had completed negotiations with a German manufacturer to the point where a price tag of \$995 had been placed on the car, the Heinkel. Plans fell through at the last minute, however, and Ward's is still looking around.

A. M. Richards, auto supply merchandise manager for Ward's, says his chain is interested in a scootertype automobile like the Heinkel, which is a 15 hp, one-cylinder vehicle. He wants to be able to offer a new



Experimental suspension system combines bellows and leaf springs

NEWS AND AVIATION



NEW VAUXHALL VICTOR STRESSES CLEANER LINES

Cleaner lines are featured on the newest GM-built Vauxhall Victor four-door sedan and station wagon. Roof, hood, trunk lid, and fender panels are smoothly contoured; parking and tail lights are simplified. Mechanical changes include larger radiator and fan, plus a wide opening hood and pancake-type air cleaner to improve engine accessibility. De luxe model has individual front seats, leather upholstery, and two-tone paintwork.

AMA Proposes New 3-Point Plan To Control Smog in California

The automobile manufacturers have taken the question of smog control to California—to the California legislature and to the doorstep of Los Angeles.

Representatives of the automobile companies went to California to answer basic questions on smog and exhaust gas emissions, and to present the Californians with some basic information on the same problem.

The issue has been long-smoldering. Los Angeles has accused the automobile industry of indifference and neglect of duty. The industry, through the Automobile Manufacturers Association, has countered that the Westerners have not tried to see the whole problem.

In Sacramento, before the state legislature, the AMA representatives proposed a three-point program: vehicle inspection, mechanical reconditioning, and installation of exhaust control devices.

The entire program would cost an estimated \$500 million.

AMA spokesmen pointed out that the smog problem is unique in Los Angeles—other areas have air pollution, but no other area has quite the same problem as Los Angeles.

To enforce installation of a control

device (at an approximate price of \$150) would not be fair to rural or small town residents, one industry official pointed out.

AMA representatives demonstrated and explained the possible control systems to the legislature.

Chrysler Loses \$34 Million; Shows Upturn in 4th Quarter

Chrysler Corp.'s net loss for 1958 totaled nearly \$34 million for the worst year in the corporation's history. The fourth quarter, however, showed an upturn with a profit of \$11 million.

Chrysler's net sales for the year amounted to \$2165 million, a drop of 39 per cent from the peak of \$3565 the year before. Earnings a year ago were \$120 million. The Chrysler deficit was its second in history. In 1932 the firm lost \$11 million.

In the final quarter, the corporation tallied sales of \$679 million. Sales and earnings in the final quarter of 1957 were \$819 million and \$16 million.

Reason for the big drop can be seen in the factory shipments comparison: 696,819 cars and trucks in 1958 against 1,381,951 units a year ago. Penetration of U. S. passenger car market fell from 19.5 per cent to 14.9 per cent.

But Chrysler is optimistic. Presi-

dent L. L. Colbert, in revealing the financial statement, said that "final weeks of 1958 and the early part of this year offered encouragement for better financial results in 1959." New car sales, he added, have continued to show improvement as consumer confidence has improved.

Chrysler's defense sales for 1958 amounted to \$325 million, or 15 per cent of total business and more than two and one-half times the 1957 defense sales of \$125 million.

National Steel Will Expand, Divert from Automotive Use

National Steel Corp. will spend \$100 million to boost its Detroit steel-making capacity and at the same time divert steel production from Detroit and the automobile industry.

The Detroit allocation, earmarked for Great Lakes Steel, a unit of National Steel, is part of a \$300 million overall program that calls for expansion and new facilities in Detroit and northwestern Indiana.

The plan calls for Great Lakes Steel to ship part of its production—70,000 tons a month—to a new steel finishing plant in Indiana. The idea is to make Great Lakes less dependent on the automobile industry.

Currently, the downriver Detroit mill turns 82 per cent of its production to the automobile industry. This is about 9.5 per cent of all automobile steel needs. By shipping 840,000 tons a year to the Chicago-area plant for the food industry, Great Lakes will be less susceptible to the ups and downs of automobile production.

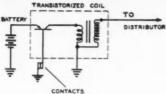
Paul Carnahan, board chairman at Great Lakes, says his company is making its forward plans with the annual production average of 6 to 6.5 million automobiles in mind.

The National Steel program includes upping Great Lakes Steel output from 3.7 million to 4.2 million tons a year. This will give the company greater capacity to serve the automobile industry. Shipping a steady 70,000 tons to Chicago will level out the peaks of production and employment.

Cadillac Air Conditions 41 Per Cent of Its Cars

Cadillac is installing air conditioning in 41 per cent of its cars and already the division has equipped 200,000 cars with the option. In 1953, the first year air conditioning was offered by Cadillac, only 8996 units, or 8 per cent of production, were equipped. Last year the total jumped to 41,807 units, or 34 per cent.





Transistors Boost Power of New Auto-Lite Ignition System

Electric Auto-Lite Co. has developed a high-voltage transistorized ignition system for automobiles that it says provides top ignition performance at all speeds.

The new unit is contained in a single package slightly larger than the conventional ignition coil which it replaces. It is compatible with other conventional automotive ignition components, the company said.

Auto-Lite said the new development basically is an adaptation of transistors to ignition use. Special circuits and other features of the new voltage transformer take advantage of the transistors' ability to switch large currents through the action of a small control or relay current. The base circuit of the transistor carries this current and is triggered by the distributor current. This action times the firing of the transistorized transformer to the engine.

Distributor contacts function in the normal manner except that they carry a greatly reduced current load. The contacts, through the use of the transistor, set off a general reaction that makes possible a big boost in voltage.

Auto-Lite has also brought out a newly designed contact set for use with the new ignition system. The new set is designed to further improve ignition at high-speeds by cutting down on high-speed bounce.

The new ignition system now is available for testing by engine manufacturers, Auto-Lite said. Tooling for production is now underway.



Battelle Memorial Institute has completed the latest of four highpressure, high-temperature cells designed to extend the boundaries of research in metals and allied fields. The cells, which operate at temperatures of over 5000 F and pressures of 2 million psi open up new areas of research by forcing atoms into positions they are reluctant to take during conventional processing.

A new finish that gives stainless steel a frosty look has been developed by Stamping Service, Inc., for use on automobile trim sections of stainless supplied by Allegheny Ludlum Steel Corp. The new finish is applied by a semiblasting technique which does not penetrate but instead forms tiny mounds which diffuse light rays on the metal surface, giving it the frosted look.

Canadair Ltd., Montreal, has developed a lightweight tracked vehicle called the "Rat" that it says can negotiate any kind of terrain (also water). Canadair says the Rat climbs 80 per cent hard-grassy normal grade, or 60 per cent snowy grade, with 1000-lb payload. The Rat is powered by a four-cylinder, air-cooled engine, weighs 2500 lb, has 22-ft turning circle, and top speed of 20 mph on land, 3 mph on water.

Firestone Tire & Rubber Co. introduced a new safety tire for passenger cars that it says has two major improvements. One is a new seal on the inner part of the tire—across the tread area—that gives greater protection against punctures; the other is a new way of treating nylon cord that stabilizes it and prevents its growth and distortion while in service.

Highly fluorinated alcohols may be the key to high-temperature lubricants for jet engines, say Du Pont scientists. Most promising compounds found so far are a fluoroalkyl camphorate and a fluoroalkyl pyromellitate. Oxidation tests indicate the camphorate can be used at bulk oil temperatures up to 400 F and the fluoroalkyl pyromellitate at still another 100 deg higher. Other tests are planned. Chase Brass & Copper Co. announced it is going into commercial production of wrought rhenium rod, wire, and strip. Rhenium, an extremely dense, silvery metal has a melting point of 5756 F—surpassed only by tungsten—and holds promise as a possible welding material for molybdenum, either in its pure state or allied with molybdenum, says Chase.

Linde Co., a division of Union Carbide Corp., announced plans to build a large liquid oxygen and nitrogen producing plant near Huntsville, Ala. in the vicinity of Redstone Arsenal. The new plant, slated for completion in 1960, will be capable of producing 100 million cu ft of oxygen and nitrogen a month.

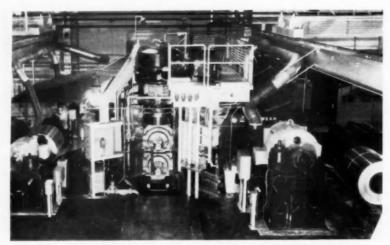
American Viscose Corp. and Sun Oil Co. have joined forces to form AviSun Corp., an equally owned affiliate that will manufacture and sell resins, film, fibers, elastomers, surface coatings and adhesives made from olefin polymers or copolymers combined with other substances.

Bunting Brass and Bronze Co. has developed new bearing aluminum bars which can be machined to fit any bearing use. Bunting will market a complete line of the bars using Alcoa B-750-T5 aluminum. The new bar is an aluminum-tin alloy with other metals—such as copper, nickel, and magnesium — added to improve its properties.

Firestone Tire & Rubber Co. announced it will build the world's first plant for the production of synthetic Diene and Coral rubbers, both Firestone products. The plant, which will be an addition to the company's Petrochemical Center in Orange, Tex. will have an annual capacity of 30,000 tons for each rubber.

NSR-X5602, the first product in General Electric Co.'s new family of nitrile silicone rubbers, is now available in evaluation quantities. Two other NSR rubbers will be put on the market later this spring. NSR-X5602 has intermediate fluid resistance.

NEWS AND AVIATION



REYNOLDS READIES BRIGHT MILL FOR OPERATION

This new 66-in. bright mill for high-speed cold rolling of aluminum sheet is being readied for production at the Reynolds Metals Co. Alloy Plant, Sheffield, Ala. Designed and built by E. W. Bliss, the two-high single stand mill has a maximum speed of 1000 fpm and can reduce sheet thickness about 50 per cent. Mill is expected to interest designers in the automative, aircraft, trailer, and other industries where brightness is important.

Checker Will Unveil Superba At International Auto Show

Checker Motors Corp. will unveil its long-awaited Superba family passenger car at the International Automobile Show April 4-12 in New York's Coliseum. Production, delayed by heavy orders for commercial taxicabs, is scheduled to begin in March, according to Checker president Morris Markin.

The Superba, a family version of the taxicab, has been held up several times from getting into production (AI Dec. 1, 1958, p. 17). Markin says the company has been concentrating on filling taxicab orders first.

Checker production for 1959 has been running at better than twice the 1958 rate, with 904 vehicles built through Feb. 14, compared with 419 a year ago.

New Bills in Congress Call For "National Auto Week"

Measures offered in both the U. S. Senate and the House of Representatives would authorize observance of "National Auto Week."

Sen. Philip A. Hart, D., Mich. has introduced H. J. Res. 49, which author-

izes the President to proclaim "National Auto Week" each spring. The week proposed for observance this year is March 15-22.

A measure with the same purpose, H. J. Res. 154, awaits action in the House. Its author is Rep. C. E. Chamberlain, R., Mich.

Two Firms Plan Comeback For Electric Automobiles

With public interest in cheaper transportation mounting, the electrically powered vehicle, long considered obsolete, may be ready to hit the comeback trail.

In San Diego, Calif., a dentist and an aircraft engineer have teamed up to produce an electrically powered automobile that can be recharged from ordinary 110-volt household out-

The car, called Charles Town-About, is being built by Stinson Aircraft Tool and Engineering Co. Stinson, an aircraft subcontracting firm, is so optimistic about the car's future that it has switched entirely to the manufacture of electric automobiles. The Town-About is a joint creation of Deane Van Noy, Stinson president, and Dr. Charles Graves, a San Diego

dentist and Stinson executive vicepresident.

The first five models of the new vehicle are slated to roll off Stinson's assembly line sometime this month. The company expects to turn out around 80 cars a month by the end of the year and reach a peak production of 1000 units a month within a couple of years.

Vehicle Aimed at Dual Market

Stinson expects its principal customers will be utility companies as well as people who want a second car for city or surburban driving. So far the company has received firm orders for 57 cars, all from utility firms. The utilities are interested in the car as a means of selling additional electricity during the slow early morning hours when batteries will be recharged as well as a cheap form of transportation for their meter readers.

The Town-About seats two adults in front and one adult or two small children in back. As its name implies, it has a limited range—it can run about 78 miles or so between charges.

The Town-About's 3.2-hp electric motors will get current from four single replaceable-celled selenium batteries under the floor. A built-in charger plugs in like a household appliance to any 110-volt outlet for overnight charging. Total weight of the four batteries is over 500 lb, or more than a quarter of the car's weight, which is close to 1900 lb.

The Town-About is expected to sell for \$2800 to start and for under \$2000 when it gets into volume production.

Competitor Off to Good Start

Stinson's one active rival in the field is the Cleveland Vehicle Co., which was formed four years ago for the sole purpose of developing an electrically powered stand-up van for short runs.

The company, headed by Walter Thomas, is currently working on its first 50 orders. Five trucks are slated for delivery in mid-March, the rest by June. Customers for the vans include dairies and bakeries in Ohio, and utility companies in Illinois, New Jersey, and Ohio.

Cleveland designed the van and is making its own bodies. Motors and controls are purchased from outside suppliers.

Cleveland is also reported to be working with American Motors Corp. and Electric Storage Battery Co. on a project to electrify a Rambler American car. The project is still in the experimental stage, although the company expects to finish a prototype by mid-April.

MEN

IN THE NEWS





Kelly-Springfield Tire Co.—Edmund S. Burke has been elected chairman of the board, and George B. Newman president and chief executive officer.

Chrysler Corp., Stamping Div.— Charles C. Mezey has been named general plants manager and A. James Savage succeeds him as manager of the Nine Mile Press plant.

Ford Div., Ford Motor Co.—Donald F. Ball was appointed manager of heavy truck sales department, succeeding John F. McLean, Jr., who has been named executive assistant to the regional sales manager in Chicago.

Clark Equipment Co., International, C. A.—Dennis T. Buckley was named district manager for Africa.

General Motors Corp., Truck & Coach Div.—Richard T. Jennings has been promoted to truck merchandising manager.

Bendix Aviation Corp., Bendix Products Div.—P. J. Manus was named district manager of the new mid-Atlantic district.

Minneapolis-Honeywell Regulator Co.—Carl A. Anderson has been named general manager of the recently acquired Marion Electrical Instrument Co., Manchester, N. H.

General Electric Co.—Harold E. Brown was made marketing manager of the Aircraft Instrument Product Section.

Chrysler Corp., Amplex Div.—Carl J. Demrick has been named president.

Dayton Rubber Co.—Charles Wyman was named production manager; Charles Moore, manager of tire development; Robert Radow, technical superintendent; and Elbert Davis, chief tire compounder.





B. F. Goodrich Co.—William W. Scull was elected vice-president, manufacturing, and Don C. Miller vice-president, marketing.

ACF Industries, Inc.—Gerard A. Muller was appointed regional sales manager of the Avion Div. and Robert G. Richardson has been named manager of organization.

General Motors Corp. — James L. Tolley was made regional public relations representative for the Flint, Mich. area, and G. Thomas Christiansen manager of staff activities for styling.

Buick Div., General Motors Corp.
—Glenn D. Wilson was named national fleet sales manager and George
G. Spaulding succeeds him as manager of retail operations.

Dow Chemical Co.—C. B. Branch has been named president of Dow International Limited S.A. and manager of all overseas activities excluding Canada and Mexico.

Bendix Aviation Corp., Bendix-Pacific Div.—John R. Harkness has been appointed electronics manager.

Bendix-Westinghouse Automotive Air Brake Co.—A. J. Steger was appointed Canadian regional manager.

Whitman & Barnes—Frederick J. Keller has become assistant sales manager.

Imperial Brass Mfg. Co.—Gordon J. Duerr was elected vice-president-marketing; George E. Franck, vice-president-engineering and research; and Fred W. Winter, vice-president-manufacturing.

Dow Chemical Co.—Robert Hansen was appointed head of the automotive chemicals development laboratory.

North American Aviation, Inc., Autonetics Div.—B. P. DuMars was made assistant to the director; A. J. Grant, sales manager-inertial navigation; W. G. Fort, sales manager-armament controls; and C. H. Sword, sales manager-computers and controls.

Carpenter Steel Co.—John E. Nevlin was appointed general manager of sales service, and T. A. Washburn succeeds him as manager of tool sales.

Chrysler Corp.—G. W. Trichel was appointed military advisor to the group vice-president defense and special products.

Radio Corp. of America—Irving C. Maust was made manager of industrial and machine tool operations.

Mardigian Corp., Prototype Div.— Dr. Paul Zivkovich has become general manager.

Landis Machine Co.—D. F. Griffin has been appointed chief metallurgist.

Thompson Ramo Wooldridge, Inc., Thompson Products Piston Ring Div. —Philip G. Stratton has been made Detroit district manager.

Consolidated Foundries & Mfg. Corp.—Robert N. Janeway has been elected vice-president, engineering.

Willys Motors, Inc.—John H. Harvie was promoted to division sales manager for the Far East.

Necrology

Jack G. Herzberg, 37, founder and president of Herzberg Corp., Milwaukee tool and die firm, died Jan. 31, at Milwaukee, Wis.

Timothy E. Levene, director of purchasing and production control for Curtis Mfg. Co., St. Louis, Mo., died Jan. 30.

Joseph J. Rings, 72, retired chief engineer of Allis-Chalmers Mfg. Co.'s hydraulic department, died Jan. 30, at Franklin, Tenn.

AVIATION MANUFACTURING



PRODUCTION LINE

Shown in this first photo of Atlas pro-duction line at Convair Div.'s San Diego plant are vehicles to be fired in U. S. test program or intended for operational squadrons. The stainless steel missiles—10 ft in diameter and 75 ft long - are nested in elevated docks. Area underneath is filled with equipment bins and electronic gear needed for checkout of subsystems. At upper left, booster sections of the Atlas have been pulled back to allow the two booster engines and the sustainer engine to be installed simultaneously.

type which power Thor and Jupiter intermediate range missiles and the Atlas long-range missile.

A thrust of 1.5 million pounds will permit the military to put into orbit much heavier payloads than now are fired in satellite programs. By using rocket engines of known performance, the Pentagon believes it will save time in achieving a power plant of desired thrust.

Small Gas Turbine Engine Catching On, Boeing Says

Boeing Airplane Co. says that its small gas-turbine engine is beginning to catch on.

The company has sold 42 turbostarters to three airlines for use in starting their large jet transport engines. The Boeing turbine is also being used to power a radio-controlled aerial target under development for the Army. The drone has speeds in excess of 400 mph.

Several advanced versions of the small engine are under development, Boeing said. One is a 300-hp turbine for the Navy. An aircraft version of the same engine develops 400 hp.

So far, Boeing has produced over 700 of the engines.

Turbo-Props Competitive with Jets, British Engineer Says

Jet airplanes may introduce more problems than they solve, for some airlines at least, according to an English engineer.

Comparing the speeds and operating costs of pure jets with turboprops, D. J. Lambert of Vickers Armstrong Aircraft Ltd., pointed out that it would cost about \$7 per minute to keep a pure jet circling above an airport waiting its turn to land, compared with only \$4 for a turbo-prop.

Ford Subsidiary Gets Award For Pacific Missile Range

Aeronutronics Systems, Inc., a Ford Motor Co. subsidiary, has been awarded a Navy contract for instrumentation planning for the Pacific missile range at Point Mugu, Calific The contract calls for a six-month survey of requirements and specifications for range instrumentation.

New Radar Navigation System Is Tested by Bendix Radio

A new self-contained long range navigation system for jet and turboprop airliners, based on the Doppler radar principle, has been flight-tested successfully by the Radio Division of Bendix Aviation Corp.

The system, which can be operated anywhere in the world without ground facilities, provides the pilot with direct reading on true ground speed, drift angle, actual course over ground and distance to destination.

A. E. Abel, general manager of the division, says four beams of radar energy are directed toward the earth from the airplane with the new device. By measuring the Doppler effect on each beam, it is possible to solve problem equations with an electronic computer to determine exact speed, both horizontal and vertical.

The Doppler principle involves compression and expansion of sound, light or radio waves to varying frequencies. Interpretation of frequency variations reveals the desired navigational information.

Bendix also is developing a special

analyzer that will monitor temperature and vibration conditions on jet engines for British Overseas Airways Corp. Boeing 707 jet aircraft.

The instrument will relay information to the flight engineer from 10 temperature and two vibration stations on each of the four Rolls-Royce Conway jet engines. Bendix Scintilla Div. will produce 20 units for delivery to BOAC later this year.

Army Slates Flight Tests for 1.5 Million Lb Rocket Engine

Flight tests of a cluster of rocket engines with an expected capacity of 1.5 million pounds thrust are slated by the Army for 1960.

In a speeded up program, Rocketdyne Div. of North American Aviation is building the new power package for the Army. The military agency responsibile for the program (Project Saturn) is the Army Ballistic Missile Agency, Huntsville, Ala.

A liquid-propellant booster made up of a cluster of tested rocket engines is to be built by the contractor and packaged as a single unit. Rocket engines in this package will be of the

Ramjet Seen as Powerplant For Supersonic Transports

Ramjet engines, which can hit at least twice the speed of today's turbojets, are being considered for use on commercial airliners.

Roy E. Marquardt, president of Marquardt Aircraft Co., predicts that some day ramjets will be able to power airliners about the size of current jet transports across the continent in one hour. Take-off power would be provided by afterburning turbojets, but the ramjets would take over at about Mach 2 speed at 30,000 ft and reach an ideal cruise rate of Mach 4 at 80,000 ft, Marquardt said.

In a recent simulated flight test, according to Marquardt, a company ramjet was run for 50 continuous hours at speeds never before reached by an air-breathing engine. This was the equivalent to a non-stop flight of five times around the globe, Marquardt added.

"The practicality or need for supersonic air transports needs to be firmly established before any accurate prediction can be made as to when such transports would be in operation," Marquardt stated.

Twin Coach Develops New Bonding Method

A new technique for bonding oddshaped aircraft parts has been announced by Twin Coach Co., Buffalo, N. Y.

The new method, known as ball bonding, makes use of aluminum balls to provide a completely uniform application of pressure on irregularly shaped parts. This method eliminates "voids," or areas where bonding with rigid tools did not take hold.

Twin Coach is using the new technique to process flaps for the Boeing B-52, and droop seals and other components for the Chance Vought F-80-1.

The company said the new process has been used successfully on all types of bonding at the Twin Coach plant, including aluminum to aluminum, aluminum to magnesium, and fiberglas to aluminum.

Solar Gets Another Contract For Honeycomb Sandwich Parts

Solar Aircraft Co. received a contract for almost \$1 million to continue manufacturing all-metal honeycomb sandwich parts for the B-58 jet homber.

The order calls for 16 different structural selections for each aircraft set. Solar has been producing structural panels of honeycomb sandwich for the B-58 since 1956.

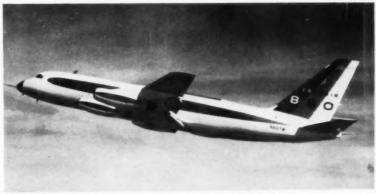


Supersonic ramjet transports may fly at Mach 4 speeds



NEW ANTI-SUB PLANE NOW IN PRODUCTION

Artist's drawing shows new Navy ASW (antisubmarine wartare) airplane with its "MAD boom" in extended position. (Gear houses Magnetic Airborne Detection equipment.) The S2F-3, being produced by Grumman Aircraft under a \$22 million Navy contract, is a new version of the company's S2F-1 Tracker ASW plane. The S2F-3 is powered by two improved R-1820 engines built by Curtiss-Wright Corp. and Bridgeport-Lycoming Div., Avco Corp.



CONVAIR 880 MAKES FIRST FLIGHT

Convair 880 is shown after takeoff from Lindbergh Field in San Diego, Calif., on its maiden flight. The new jet transport, designed to operate from any airport that can accommodate big piston-powered transports, used less than half the 8100-ft runway on this flight. The 880 is powered by four General Electric CJ-805-3 jet engines.

Carburetor Production Requires Variety of Manufacturing Operations

LTHOUGH the Rochester Products Division of General Motors Corp. is best known as the major supplier of carburetors for GM divisions, it is also an important supplier of such automotive items as cigarette lighters, locks and keys, and welded and brazed steel tubing. As a matter of fact, RPD is considered to be one of the largest producers of automotive and refrigeration steel tubing. accounting for more than 50,000 miles of tubing in 1958 in sizes ranging from 18-in. to 1-1/4-in., the latter size being used for shifter tubes. It is noteworthy that each vehicle takes about 50 ft of tubing. on the average, for brake and fuel lines and for shifter tubes.

The manufacture of carburetors is an exceedingly complex operation when you consider that in current production RPD supplies single-jet, two-jet, and four-jet carburetors in a variety of some 88 models. Actually there are not that many basic carburetors. The variety of models is accounted for by variations in specifications: modifications due to differences in calibration, altitude control, transmission linkage controls, and the addition of governors for truck engines.

But the modern carburetor itself is a complex mechanism requiring some 257 different parts for a fourjet unit, and about 161 parts for a two-jet unit. To build quality and performance at a low cost requires close cooperation between engineering, manufacturing, and quality control.

Operations in this plant are so numerous and so diversified as to make it difficult to provide even a generalized picture. Consequently, we have selected a group of illustrations that cover a variety of manufacturing operations. These views, together with explanatory captions will give some perspective of what goes on.

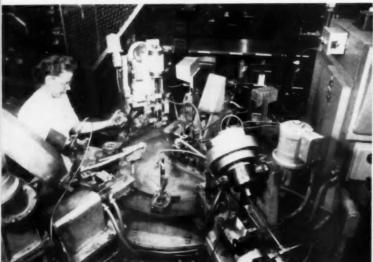
Besides the problem of product variations there is an even more serious one of the quantities involved in the machining of compo-

ASSEMBLING

Fig. 2—Automatic assembly of accelerator pump shaft and lever is handled on this eight-station machine. After the parts have been installed by the operator, the end of the shaft is lubricated, spun over, and the part automatically ejected.

Fig. 1 — Assembly machine for the single-jet air horn. The operator loads castings onto the fixture while the automatic heads apply nozzle, idle tube, and three lead ball plugs.







By Joseph Geschelin

WASHING

Fig. 5—One of a new battery of Centri-Spray washing machines, this one arranged for washing four-jet throttle body assemblies. The washers are equipped with an indexing dial and accurately positioned nozzles for thoroughly cleaning all holes and passages.



nents. Generally speaking, RPD employs inline transfer type machine lines for all high volume parts; and individual machine setups for lower volume parts. Most of the inline equipment was designed and built here, although some elements were supplied by machine tool builders. Parts required in lower volume are generally machined in a variety of Kingsbury multiple-head drilling machines.

The modern carburetor is so complex and must provide such unfailing performance in a motor car that quality control assumes major proportions. Acting on the principle that quality must be built in, all of the machine lines, sub-assembly have been provided with a variety of automatic inspection stations, some of which are illustrated to indicate typical examples. In addition, machines such as drilling units are

equipped with automatic probe stations to make sure that all holes have been drilled and to check for depth ahead of tapping.

Cleanliness is not a new idea in an automotive plant. At RPD where many fine holes and passages are involved cleanliness is a positive must. To this end, they have installed recently a number of the familiar Centri-Spray washing machines with directed high pressure sprays to assure cleanness at every stage.

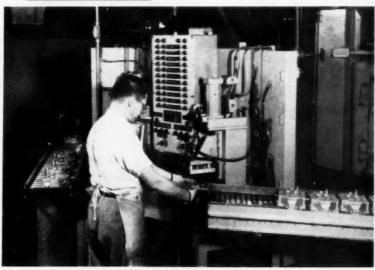
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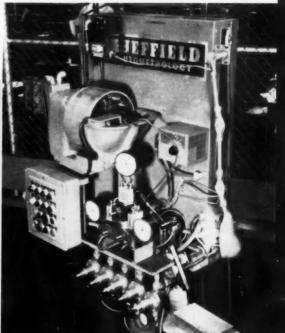
INSPECTING

Fig. 4—Sheffield automatic inspection machine that gages critical flow parts such as the idle restriction, in this case. These tiny parts are checked for ID, OD, and length, ID orifice size being held to plus or minum 0.0005 in.

Fig. 3—Indication of missing holes, holes that do not belong in a particular part, or holes partially blocked by chips or burrs is provided automatically on the four-jet float bowl inspection machine seen here.

INSPECTING





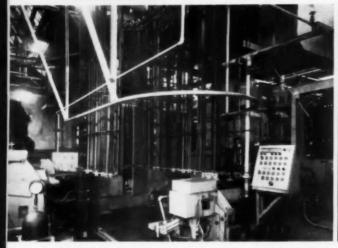


Fig. 6—Magazines such as this one are provided on inline machine lines to store high volume parts between operations. The group shown here can store up to 1800 two-jet throttle body castings.

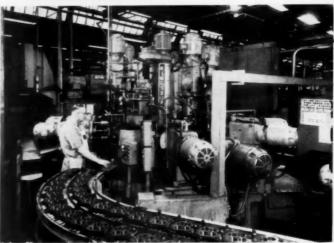


Fig. 7—One of a group of five Kingsbury drilling machines on the line for machining Oldsmobile throttle bodies for four-jet carburetors. This center column machine handles 22 operations.

In line with current practice, RPD has a final flow bench inspection of all carburetors as they come off the assembly line. Supplementing this is a sampling procedure in which carburetors are taken off the line and given a complete schedule of testing on a research type flow bench. In addition, a sampling of carburetors is made for tear-down. Here the carburetors are completely disassembled and all components checked to verify mechanical tolerances. This is intended as a running check of component machining. Results of such supplementary inspections serve as a feed-back on everything that goes on in the manufacturing department.

Besides the machining facilities mentioned briefly above, RPD has developed a large variety of automatic assembly machines for use wherever cost economy justifies them. One example of this is seen in Fig. 1. This is an assembly machine for the single jet carburetor air horn. Here the operator loads the castings onto the fixtures on the index table, the automatic stations being responsible for the installation of nozzles, idle tube, and three lead plugs. Castings are delivered to the machine on a belt conveyor; completed assemblies drop out onto a chute, then are transported to the

next operation on a belt conveyor.

The accelerator pump shaft and lever assembly is produced on the eight-station index machine seen in Fig. 2. Components are loaded manually in the fixtures, then the end of the shaft is lubricated, spun over to hold the lever securely, and automatically ejected. To justify this machine a second set of fixtures has been provided for rapid change-over to the assembly of another part. The change is made simply by removing the locating pins, turning the dial plate one-half an index to bring the second set of fixtures into position, then replacing the locat-

Mention was made earlier of the automatic inspection machines employed at critical points. An example of such electronic devices is shown in Fig. 3. This is the automatic inspection of four-jet carburetor float bowls to indicate missing holes or holes partially blocked by chips or burrs. It also seeks the presence of holes that may have been drilled inadvertently. Rejects are indicated by red lights on the panel. Accepted castings are automatically unclamped but rejects must be unclamped by the operator, thus providing a second check on rejection. The machine has two stations to permit the operator to load

a part while another is being inspected.

Critical flow components having fine orifices are automatically inspected in the special Sheffield machine, Fig. 4. Idle restrictions are hopper fed to the inspection station where they are checked for ID, OD, and length. The orifice is the most critical element, being held to plus or minus 0.0005 in. The machine is capable of inspecting 3600 pieces an hour without attention.

Typical of the special Centri-Spray washing equipment is the one in Fig. 5 which handles fourjet throttle body assemblies. This washer has an indexing dial and accurately positioned nozzles for reaching and thoroughly cleaning all holes and passages. Washing solution is maintained at room temperature and does not require heating in the air drying stages. The circulating pump delivers 800 gpm at 50 psi. The parts seen here are going through a second wash after assembly because of the critical drilling operations performed at this stage. Similar washers are employed for cleaning four-jet bowls and air horns.

With mechanization carried out to the fullest extent there is also the problem of sorting high volume parts between operations. Figure 6

MILLING



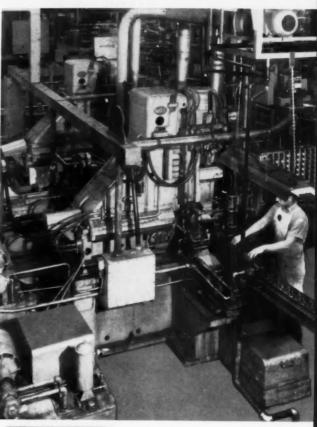
Fig. 8.—Motch & Merryweather duplex milling machine handles the straddle-milling of four-jet throttle bodies ahead of the inline transfer machine. It is equipped with a four-station indexing table, permitting the operator to load parts while the milling head on the opposite side is in action. Parts are unloaded automatically.

shows some of the magazine storage units for banking castings. This group stores up to 1800 two-jet throttle body castings between the stradde-milling operation and the inline transfer machine. Castings are loaded automatically into the magazines at the left, and automatically delivered on demand to the first station of the inline machine at the right. Similar equipment is used between inline sections.

Kingsbury machines are employed for many of the machining operations. Typical of this is the machine line for Oldsmobile four-jet carburetor throttle castings, Fig. 7. This shows one of a line-up of five Kingsbury machines. The center column machine in this view performs 22 operations. Roller conveyors connect the various machines on such lines. Other four-jet throttle bodies, of cast iron, are machined on an inline transfer machine.

First operation, before entering the inline machine or Kingsbury machine, is the straddle-milling of both sides in the Motch & Merryweather mill shown in Fig. 8. As seen here, the machine has a fourstation index table, permitting the operator to load the part while one Fig. 9—This is the three-station Nathree-station Nathree-station Nathree-state machine, constituting the last stage of the inline transfer machine for machining Chevrolet four-jet throttle bodies. Each station holds three pieces. The first station roughreams the four bores, the second station gun-drills the shaft holes, the third station finish-reams the bores.

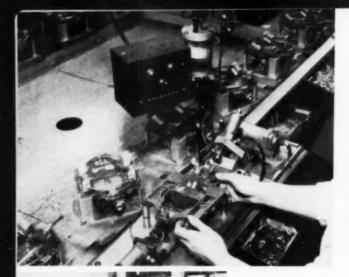
Fig. 10—A portion of the four-jet carburetor assembly line. Major sub-assemblies are built up at other areas, inspected, and delivered to the line by conveyor. Assembled carburetors are transferred to a belt conveyor for transport to the flow stands.



REAMING

ASSEMBLING





INSPECTING

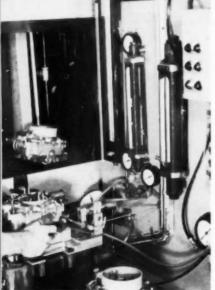
Fig. 11 - Checks for leaks between the float needle and needle seat made autoare matically and without operator judgment on this electronic bubble tester. Leaks are indicated by bubbles in the bubble chamber, frequency of bubbles being counted by a photocell.

and throttle body are built up and inspected in other areas, transported to the assembly line by con-

Testing for minute leaks at high speed has required unconventional procedures. RPD employs an electronic bubble tester (Fig. 11), for checking leaks between the carburetor float needle and needle seat. This element is subjected to a vacuum source, leaks being indicated by bubbles in a bubble chamber placed in series with the vacuum line. A photocell inside the chamber counts the frequency of bubble generation, thus dispensing with operator judgment. A green light indicates acceptance, a red light indicates rejection.

As carburetors come off the assembly line they move past flow test benches such as the one seen here, in Fig. 12. Operators then check each one for fuel-to-air ratios at various throttle settings from idle to wide open. Spark and choke settings and windshield wiper vacuum also are checked on these stands. Air is drawn through the carburetor by a vacuum pump, air flow being measured by a differential manometer, fuel flow by a flow meter.

Finally we show one illustration in the tubing department (Fig. 13) -the special machine for automatically forming condenser coils for automotive air conditioning units. A typical coil contains some 25 bends, measures 19 by 25-in. A stack of 10 coils is formed simultaneously from 3/16-in. OD welded steel tubing, starting with straight tubes about 60-ft in length. The bender automatically feeds the 10 pieces of tubing through forming rolls, forming 180-deg bends alternately to right and left until the coil has been completed.



INSPECTING

Fig. 12—Typical flow stand used for inspecting assembled four-jet carburetors as they come in from the final assembly line. Fuel-to-air ratios at various throttle settings from idle to wide open, spark and choke settings and windshield wiper vacuum are checked here.

is being milled on the opposite side. The machined casting is unloaded automatically.

The three-station Natco transfer machine, Fig. 9, machines bores and throttle shaft holes. Prior machining operations are performed on a two-section inline machine designed and built by RPD. The first station of the Natco semi-finishreams the bores; the second station gun-drills the throttle shaft holes; and the third station finishreams the bores. Three castings are machined at a time to keep pace with the output of the two-section inline machine which performs the preceding operations.

Four-barrel carburetors of all types are assembled on a continuously moving pallet conveyor, as shown in Fig. 10. Major sub-assemblies such as the air horn, bowl,

BENDING

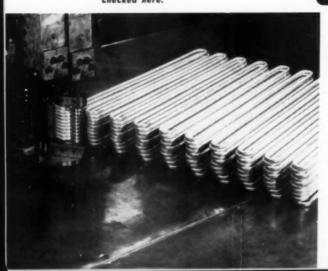


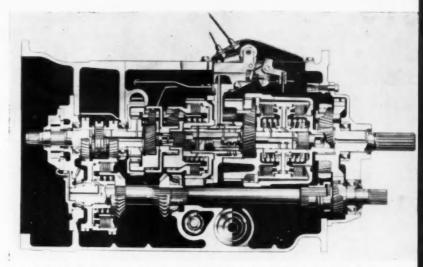
Fig. 13 - One of many serpentine benders in the tubing depart-ment, this one condenser coils for automotive air conditioning units. It automatic ally feeds 10 straight sections of tubing each about 60-ft in length, forms a stack of 10 coils. A typical coil contoins 25 bends, measures 19 by 25-in.

The cost of ground support equipment, with respect to the overall cost of a weapon system, is about 70 per cent for an ICBM, 50 per cent for a heavy bomber, and 20 per cent for modern fighters.

. . .

Gear ratio changes are made with the tractor in motion and with virtually no hesitation. "Shifting" involves the movement of the selector lever until the desired gear ratio shows in a window next to the lever. The gear ratio, and tractor ground speeds at three engine rpm settings, are clearly visible to the operator.

In addition to the 10 forward speeds, the transmission provides two reverse gear ratios, and the



A cross section view of the Ford Select-O-Speed gear train illustrates that the power shift feature is provided by three hydraulic clutches and three brakes controlling three planetary gear sets. The fourth planetary set at the rear of the transmission is a constant reduction.

Ford's 10-Speed Tractor Transmission Is Controlled by One Lever

positions of "neutral" and "park."

Operation of the tractor's power take off is completely independent and can be engaged or disengaged with the tractor moving. A "pushpull" handle close to the selector lever controls the PTO.

The power shift feature is provided by three internal hydraulic clutches and three bands controlling three planetary gear sets. A fourth planetary gear set gives constant gear reduction. All gears are in mesh at all times, and application of various combinations of bands and clutches activates different sets of gears.

The operator selectively shifts the gear ratio to keep the tractor's ground speed under control at all times. He can up-shift or downshift at will.

The control lever connects by enclosed cable to the transmission's hydraulic system. A lighted dial of the selector shows the 10 forward, and two reverse speeds, and "neutral" and "park" positions. Ground speeds at three engine speeds also are visible. Stops, which can be

overridden, prevent shifting from forward speeds past "neutral" and into reverse. Detents at all positions give the operator a "feel" of the transmission so that he can make shifts without looking at the dial.

Ratio change from one speed to another is kept at a minimum. Forward speeds range from 0.6 mph at 1200 rpm to over 18 mph. Reverse speeds are from 1.8 mph to over 5 mph.

The automatic park feature of the transmission is a positive bandtype lock-up of the rear wheels. It can be manually engaged even when the tractor is moving and is automatically applied when the tractor engine is not running, regardless of position of the selector lever.

A transport disconnect enables the tractor to be moved with the engine off, and permits towing the tractor at highway speeds.

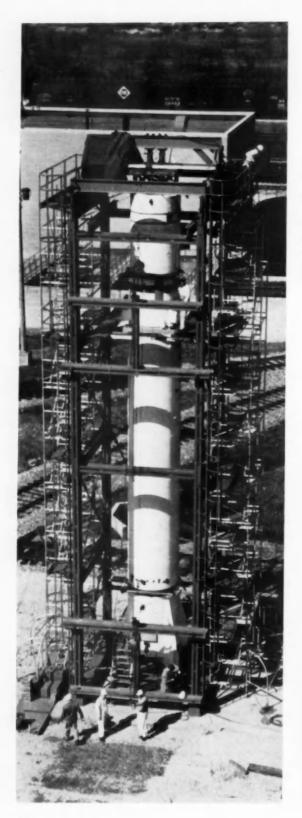
A feathering—or inching—pedal, in the position commonly occupied by a clutch pedal, is provided for moving the tractor slowly for hooking up implements, starting heavy loads, or for stopping the tractor without resort to gear ratio change.

The engine's starter switch is interlocked with the selector lever so that the tractor must be in "park" for starting. The transmission brakes will remain locked until the selector lever is moved to a speed setting.

The independent power take off, (Turn to page 35, please)



Ford's new tractor transmission is controlled by this one lever, with gear ratio change being made without stopping or using a clutch pedal.



Making and Assembling Redstone and Jupiter

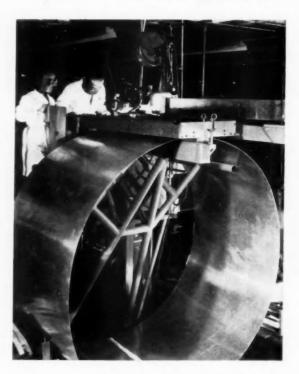
The 60-ft
vertical test stand
for simulating
flight loads and
their effect upon
the missile structure.
Stress analysis
at critical points
is studied
from the signals
of hundreds of
strain gages.

stemming from automotive experience have been employed by Chrysler Corp. in the development of fabrication and assembly operations for Redstone and Jupiter missiles. The Chrysler-operated Michigan Ordnance Missile Plant is the only one of its kind operated by a motor car manufacturer and Chrysler is said to be the first U. S. missile builder to place large ballistic missiles in scheduled production.

Chrysler has made enormous

ASS production concepts

Close-up of one of the huge rotating fixtures, provided with a Progressive inert gas welding head for making circumferential welds in the tank section of the Jupiter. Chrysler has made enormous strides in the development of facilities and methods and tooling in this 2-million-sq ft plant. With employment exceeding 11,000 people it is a highly organized facility complete with equipment for manufacturing, testing, qual-



MISSILES

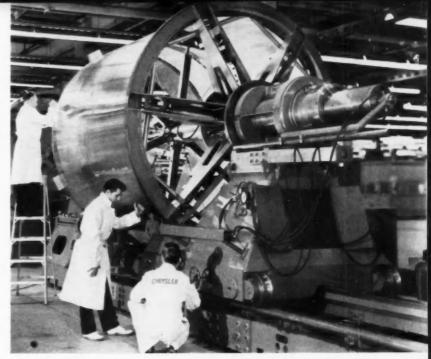
ity control and all of the elements required in producing a missile ready for deployment to the armed forces here and overseas. When one sees at first hand what it takes to produce and inspect some 300,000 items; the advanced types of digital and analog computers that are in constant use; the electronic check-out equipment for static testing; high temperature test facilities; etc., it becomes easier to appreciate why missiles take so much tax money.

Moreover, earlier in the month Chrysler announced the formation of an Advanced Projects Organization within the Defense Group to specialize in concept and planning of new weapon and space system projects. This should be important in keeping the plant going in the future.

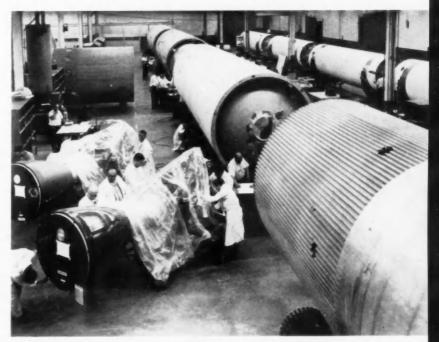
As an example of how automotive experience can be harnessed in other directions, Chrysler cites the laboratory testing techniques that were employed in developing the Redstone tactical nose cone. Not only did they solve the high speed re-entry problem but the project was developed on a highly compressed time schedule at low cost. Moreover, it was found to be completely successful in its first test firing.

One example of advanced techniques is found in the row of vertical assembly fixtures for the Jupiter tail assembly. These framing fixtures are installed in deep pits permitting operators to work at several levels simultaneously.

Large expanding rotary spiders have been developed for locating and holding Jupiter cylindrical sections for spot welding. Enormous, mechanized fixtures are used for engine and ballistic shell



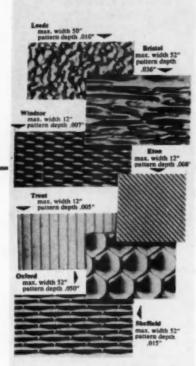
Progressive welding machine for making circumferential welds on Jupiter shells.



Redstone and Jupiter missiles are assembled on parallel lines in this area. The Redstone line may be seen in the background at the right. In the foreground, Jupiter engines are being moved into position for installation in the booster section.

alignment while welding circumferential seams with special Progressive inert gas welding heads. These fixtures employ a theodolite sighting device and a hydraulic system for rotating the shell slowly and accurately while the welds are made in perfect alignment.

(Turn to page 63, please)



A selection of textured metal patterns offered by Ardmore Products Inc. They are available in all flaishes — plated, painted, polished, or anodized

Decorative Metals Broaden Styling Possibilities

Expanded, Textured, and Perforated Materials Finding Host of Automotive and Aircraft Uses with Promising Future Ahead

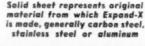
EVER before has product design been so important as it is today. Persistent consumer demand for frequent product restyling has compelled manufacturers to seek lower-cost alternatives to major design changes. This factor has been largely responsible for the recent increase in the production and use of decorative metals that satisfy the basic elements of design—shape, texture, and color—yet are at the same time functional.

Expanded, textured, and perforated metals are three general classes of decorative materials that offer almost unlimited possibilities to the designer's creative ingenuity. They are available in a wide

range of metals and alloys, can be finished by virtually every known method, and lend themselves to coloring with every hue of the rainbow. Easily fabricated, they can be supplied in an infinite variety of shapes and patterns.

Costs of these materials may often be higher than those of plain sheet or strip. However, these slight additional costs may be balanced or out-weighed by advantages in use. In cases where the gage of the metal can be reduced by using expanded or textured sheet or strip, initial material costs may actually be reduced. Second, when scratches or blemishes on plain material cause a high rejection rate or increased finishing

This series of photographs from U. S. Gypsum Co. shows the steps involved in making the company's Expand-X expanded metal





Serrated knife in one thrust slits metal at regular intervals and expands strands into diamond-shaped mesh

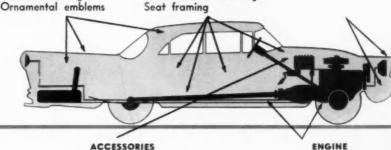


BODY AND CHASSIS -

Roof trim
Headlining trim brackets
Rear deck trim
Fender trim
Quarter panels
Garnish moldings

Instrument panels
kets Door panels
Floor boards
Exterior side panels
Scuff plates
Gear selector housings
Seat framing

Radiator grille Fresh air intakes Airscoop grilles Headlamp escutcheons



Air conditioner controls Radio speaker grilles Ash receivers Glove box doors Speedometer escutcheons

Oil filter screens Air cleaner screens Mufflers

costs, the use of these decorative metals may well reduce or eliminate such problems.

The automotive and aircraft industries are steadily increasing their usages of these metals for their decorative and functional advantages. They are now found in large quantities on both interior and exterior applications in passenger cars and other automotive vehicles, and in commercial and military aircraft alike. Specific examples are discussed below under the sections pertaining to the various materials.

EXPANDED METALS

Light in weight, yet more rigid than the parent sheet from which it is formed, expanded metal is produced in aluminum, carbon steel, stainless steel, brass, copper, Monel, nickel, etc. Carbon steel, aluminum, and stainless steel are the metals most frequently used. The others named with expanding characteristics are usually supplied upon special order.

Standard patterns are furnished in meshes ranging from 1/16 in. openings across the short way of the opening to four in. or more, depending on such factors as the gage, width, type of material used, and its intended application. Although designs have been predominantly in a standard diamond, there are many new and interesting patterns for decorative purposes. Weight and structural strength will vary considerably according to opening size, gage, and whether the metal is flat or rectangular.

There are no set rules governing the characteristics which may be specified for expanded or other decorative metals. An endless variety of weights, sizes, patterns, etc., either are available in stock or can be supplied by manufacturers on special order.

Expanded metal is furnished in standard expanded, flattened expanded, and fabricated expanded types. The term "standard expanded metal" is applied to expanded metal furnished unflattened. The term "flattened expanded metal" is applied to expanded metal that has been flattened. Flattened expanded metal provides a plain surface. The surface of standard expanded metal is in profile from bridge to strand (textured). Fabricated expanded metal applies to any expanded metal, standard or flattened, which has been fabricated into an end product

Knife descends to take its first bite in initial phase of fabricating operation; contours are shaped like one-half diamond Knife has been raised and moved over to the center of bond; sheet then moves forward the width of a strand Knife descends again to finish first row of diamonds; operation continues until full sheet is completed Finished expanded metal still attached to parent sheet. Final guillotine stroke will separate them







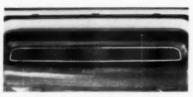




Plymouth instrument panel assembly with roll-coined design (Electric Auto-Lite Co., Bay City Div.).

This script plate is of one-piece anodized aluminum construction. Mounting lugs are cold forged from plate to make the lugs and plate one integral unit (Etched Products Corp.).

CAR AND TRUCK APPLICATIONS



The grille shown installed on this Ford truck was made by Penn Metal Co. of 0.060-in. aluminum sheet. The grille piece was subsequently blanked out by Firestone Steel Products Co. to exact size perferating so that the letters in the name "Ford" could be mounted. The piece of expanded metal was also framed in with an anodized aluminum frame.



Textured finish on aluminum for passengecar glove compartment front gives a soft and diffused effect that is pleasing to the eye (Aluminum Co. of America).



Door panels on the 1959 Chevrolet Corvette are produced by the RolDie process which permits close registration of embossed squares with lithographed color in the depressed areas. Material is 0.020 one quarter hard 3003 aluminum with clear epon coating [CroRoto Div., Groname, Inc.].

or component of an end product. The material can be furnished crimped, corrugated, and otherwise formed.

The production techniques involved in expanding metal are basically simple. Following is a brief description of the process used by one prominent manufacturer. After cleaning (if necessary), the sheet is fed into giant presses where a serrated guillotine knife slits and stretches it, one row of half diamonds at each stroke. The machine then shifts the sheet sideways the width of one-half diamond, and the knife cuts and stretches it again, thus completing one row of uniform diamonds.

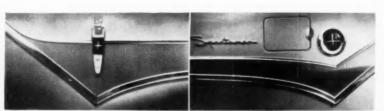
Expanded metal leaves the machine in an inclined-to-vertical plane, its length (parallel to the knife) the same as the solid sheet introduced to the knife on the horizontal machine bed. Width of the sheet, however, increases several times during expansion.

The fabrication of expanded metal is easy. Cutting, bending, and welding can be done with the same kind of machinery and tools used for working solid sheet. The metal can be cut with power shears or a gas torch; it may be bent to a predetermined shape in a power brake; it may be punched or drilled through a template; it may be arc welded, fusion welded, or spot welded.

Expanded metal lends itself to a wide range of finishing methods. Aluminum is generally anodized clear or colored and chemically brightened or etched, although for some applications it is porcelain enameled. When aluminum is expanded after color anodizing, unique effects result in bright sheared edges in combination with color anodized surfaces. Carbon steel is painted or otherwise finished for decorative purposes: it can also be plated, porcelain enameled, rubber-coated, plastic-coated, tinned, and lead-coated. Stainless steel is frequently polished.

Numerous applications for expanded metals are being found in automotive vehicles and aircraft with a promising future ahead. In passenger cars, for example, decorative patterns are used for grilles of various types and on dashboard panels; a regular diamond pattern is also being used in mufflers to hold insulation in place.

Expanded metal is found on truck grilles and guards, non-skid running boards, cab steps, side panels, exhaust shields, walkways on tank trucks, flooring and plat-



Quarter panel of the 1959 De Soto Adventurer (left) features engine turn embossed pattern No. 129 with permanent gold anodized finish. The Fireflite series (right) incorporates insert of vertical ribbed pattern No. 690 in quarter panels with clear anodized finish. Material in both cases is 0.025 half hard 5457 aluminum (CroRoto Div., Croname, Inc.).

SHEET AND STRIP PROCESSING

forms, while buses use it in radiator and ventilating grilles.

In the aircraft industry, expanded metal is largely used by both military and commercial plane builders and operators in maintenance dock flooring, baggage compartment separators, compartment door vents, bucket seats, grilles, and sides for movable loading and unloading ramps.

TEXTURED METALS

It is in the area of sheet metals with patterns rolled into them that the confusing proprietary terminology that surrounds the entire decorative metals field becomes most arbitrary. Such terms as coined, embossed, patterned, textured, etc., are widely used. The lines of distinction among these terms and the processes to which they apply are in many cases so finely drawn that it is quite difficult to distinguish one from the other.

The author has chosen the namenclature "textured metals" as a broad designation for this group of decorative metals because it is the term perhaps most familiar to persons in the design field. It may generally be considered to encompass coined, embossed, and patterned, but not corrugated, metals. Textured surfaces are defined as those having more than one plane. The deformations are usually two or three-dimensional and may be caused by a number of processes, including those mentioned above. Surfaces that have been textured generally scatter reflected light and give a soft diffused effect which is pleasing to the eye.

Coining

Coining, a particular type of texturing, is essentially the displacement of metal radially to fill a die cavity and is frequently used as a sizing operation.



Two assistant mill operators at Ardmore Products, Inc. receive leading portion of sheet of textured Type 302 stainless steel as it comes through the 20-in. by 54-in. forged steel rolls.



Operator in the Torrington Div. of American Brass Co. applying embossed pattern to a six-in. wide yellow strip.

BUS APPLICATION

Two-level bus wainscoting of Rigid-Tex metal (Rigidized Metals Corp.).

The process is generally used to accomplish a one-sided design only on sheet or strip by a cold rolling operation in which the desired pat-



ACKNOWLEDGMENTS

The author wishes to express his appreciation to the following organizations for their helpful cooperation in providing data for this article:

Aluminum Co. of America American Brass Co. American Nickeloid Co. American Society for Metals Ardmore Products, Inc. Beech Aircraft Corp. Boeing Airplane Co. Cessna Aircraft Co. Chicago Perforating Co. Colonial Alloys Co. Croname, Inc. Cross Engineering Co. Designers Metals Corp. Diamond Manufacturing Co. Douglas Aircraft, Inc. Electric Auto-Lite Co. Erdle Perforating Co., Inc. **Etched Products Corp.** Exmet Electrical Corp. **Expanded Metal** Engineering Co. Fabrite Metals Corp. Fairmont Aluminum Co. Harrington & King Perforating Co., Inc. Hiller Helicopters, Inc. Jelliff, C. O., Mfg. Corp. Kaiser Aluminum & Chemical Sales, Inc. Kaman Aircraft Co. Larsen Tool & Stamping Co. Lockheed Aircraft Corp. Manhattan Perforated Metal Co., Inc. McKey Perforating Co., Inc. Mundt, Charles, & Sons North American Aviation, Inc. Northrop Aircraft, Inc. Penn Metal Co., Inc. Piper Aircraft Corp. Reynolds Metals Co. Rigidized Metals Corp. Rolled Alloys, Inc. Ryan Aeronautical Co. Ryerson, Joseph T., & Son, Inc. Sikorsky Aircraft, division of United Aircraft Corp. Stolle Corp. Temco Aircraft Co. U. S. Gypsum Co. U. S. Steel Supply, division of U. S. Steel Corp. Vertol Aircraft Corp. Wheeling Corrugating Co. Whitehead Metal Products Co., Inc. Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp.

tern is engraved on one hardened, forged steel roll running against a flat unengraved roll. As the sheet or strip passes between the rolls, the metal is conformed to the pattern.

However, rolls or dies to produce coined sheet or strip may have another pattern engraved on the second side to produce different patterns on the top and bottom surfaces of the metal; a dime is a case in point. Letters, emblems, and script plates are examples of automotive trim parts produced by coining.

Embossing

The production technique of embossing sheet or strip basically is the passing of plain metal between indexed rolls with a male pattern engraved on one roll and a matching female pattern on the other allowing a controlled flow of metal. If necessary, subsequent roller-leveling or stretcher-leveling can be used to produce a commercially flat sheet or strip. By distributing the metal above and below its original plane in a clear-through pattern, the strength-weight ratio factor is increased.

Embossing quite definitely changes the mechanical properties of sheet or strip, whereas coining as a rule has very little effect. No meaningful general data can be provided on the degree of change in mechanical properties wrought by embossing. This factor is entirely dependent on the design and depth of each pattern and thickness of the metal being processed. However, it has been proved that embossing increases the following mechanical properties: a) structural rigidity; b) impact strength; c) buckling strength; and d) tensile strength, primarily due to cold working.

A differentiation should be made between metal that has been strengthened by embossing and metal that has been strengthened by corrugating. Essentially, the former process means hundreds or thousands of little draws in the metal with the resultant panel not showing much dimensional change from the flat material prior to embossing. This means more strength

per square foot at the same weight, not more strength per square foot at an increased weight because of the shrinkage experienced in corrugating.

Embossed metals can be fabricated the same as flat-rolled metals with standard tools and equipment. They can be blanked, punched, and even drawn in press and die equipment; in the case of perforating, the embossing operation generally follows the perforating. Welding, soldering, and riveting can be readily performed.

All metals, the ferrous and nonferrous, perforated or solid in practically every finish, can be embossed. Aluminum is highly popular because it can be color anodized in gold, silver or any other color desired. It is the primary material used for automotive and aircraft applications of embossed metal.

Embossing is especially helpful in providing a surface for color anodizing. An anodic coating often serves to magnify any surface imperfections of flat aluminum. The embossing will cover up defects and provide a material that eliminates some problems of the anodizer.

Cold-rolled mild steel strip also ranks high in importance for general use, as does stainless steel. Recent developments indicate that it may be practical to use applied colors with stainless steel. By subsequently highlighting (buffing off the high spots), a sparkling contrast of the natural stainless and the color at the base of the pattern characteristics may be presented.

Initial automotive applications of embossed metal are almost a decade old now. An embossed herringbone aluminum scuff plate was used by Ford as far back as 1949. Both Plymouth and De Soto used embossed, perforated stainless steel and aluminum for radio grilles in 1948 and 1949.

During the past three years, Plymouth, Dodge, Ford, De Soto, Mercury, Oldsmobile, Chevrolet, and Buick, for example, have used embossed metal extensively for such interior and exterior applications as: instrument panels, ornamental emblems, side seat panels,



Aircraft heater jacket of Rigid-Tex metal (Rigidized Metals Corp.)



- AIRCRAFT APPLICATIONS -

garnish moldings, rear deck trim, door panels, exterior side panels, roof trim, gear selector housings, scuff plates, glove box doors, perforated radio grilles, and headlamp escutcheons.

One of the principal features of embossed metal which makes it popular among the automobile manufacturers is that an entirely new appearance can be created by merely changing the texture of the pattern and adding color to the material without incurring expensive die changes (by using the same dies).

Embossed metal has more recently been used on trucks as well in such applications as stainless steel linings for special-purpose bodies, flooring, and outside panels. It is also found in bus safety reflectors, modesty panels, seat backs, rear seat risers, driver's enclosure, luggage rack paneling, and scuff plates.

The total number of applications in the aircraft industry to date has been small compared to the automotive field. There is, however, definite interest on the part of aircraft manufacturers in using embossed metals.

Both Douglas and Lockheed are

Metal trays made of Wheeling ExM expanded metal are used extensively for painting detail parts of the Convair F-102A supersonic all-weather jet interceptor. Some of the trays are used on a continuously moving conveyor line, while others are hand-moved. Use of expanded metal allows excess paint to go through the tray into the spray booth waterfall, thereby permitting parts to be painted evenly without build-up or overspray (Wheeling Corrugating Co.).

now incorporating embossed metal into their new jet liners. Piper is using it in the door sill and trim between the window and rear seat in the Comanche. Vertol is using embossed aluminum alloy sheets in the top skin of the H-21 and HUP-2 floors. It is also finding use in plane stair steps, heaters, and engine shrouds, etc.

PERFORATED METALS

Stated in simplest form, perforated metal sheets are those with holes made by progressive die punching. The 1958 Ford grille is a good example of perforated aluminum. The appeal of perforated metals lies in the visual effect and the interest created by diverting the eye and creating areas where



Embossed metal cap at rear of arm rest on DC-8 Jetliner unitized seat protects area from passenger sitting to the rear who may use it as a toe rest (CroRote Div., Croname, Inc.).

light will reflect a pattern and color in an appealing fashion.

A great variety of patterns of every type are available in perforated metals. These materials can be manufactured in precolored metals, or they can be colored after perforating. There are many types of pre-coated sheet on the market today. The perforations lend a variety of texture to the original metal, and this can be increased and varied by the patterning techniques that emboss additional patterns into the perforated sheet.

Perforated metals are available in every conceivable thickness so that all weights of material can be represented. There is a great diversity of sheet and coil sizes available. Types of material that are perforated would include all metals and alloys that can be punched-steel, aluminum, stainless steel, nickel, copper, brass, etc. -as well as plastic materials that lend themselves to the perforating process. Shapes perforated would include round, square, oblong, and slotted holes, plus a variety of special decorative patterns. Hole sizes or diameters run from as little as 0.016 in. round to 9 in. round. Hole

spacings or arrangements may be either straight or staggered.

The characteristic of the many metals perforated are manifold. No set "rule of thumb" can be given; each would be different depending upon hole size, shape, arrangement, per cent of open area, margins, kind of metal, gage of metal and sheet size, to name a few of the factors involved.

Perforating reduces the weight of a sheet from as low as 5 per cent to as high as 60 per cent, depending on the design. Structural strain will vary with the amount of open area that has been perforated into the sheet. The greater the gage between the holes, the more structural strain remains, depending on the thickness, of course. The strength will naturally depend on the material and the design. Perforated metals are not actually intended for use where critical stresses are involved.

No special processing techniques are employed with perforated metals. They are furnished gen-

erally in flat rectangular sheets; but they can be rolled, formed, sheared, welded, brazed and fabricated into various shapes, such as cones, cylinders and boxes. The metals are frequently anodized painted, plated and polished. They can also be bonded to other materials, such as plastics and paper, to lend additional interest and to give greater corrosion resistance or to add acoustical properties.

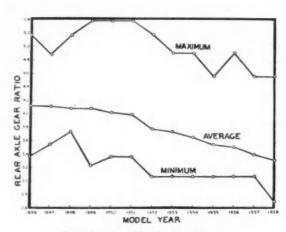
Perforated metals and materials are used quite extensively by the automotive industry. Applications include radio speaker grilles, interior decorative trim, front radiator grilles, air scoop grilles, headliner material, decorative front grilles, fresh air intakes, oil filter and air cleaner screens, and special stainless steel truck, bus, and tractor mufflers.

On the whole, the aircraft industry uses perforated materials less for decorative and more for functional applications. Sound-proofing devices for jet engine noises are a good example.

ASLE Holds Gear Lubrication Symposium

T the Gear Lubrication Symposium of the American Society of Lubrication Engineers, held in Chicago Jan. 25-27, studies of some of the problems in sliding velocity and lubrication of automotive and heavy-duty gearing were presented and discussed. In a paper by D. L. Powell and H. R. Barton, Illinois Institute of Technology, it was shown that increases in pinion offset and gear ratio both tend to increase sliding velocity of hypoid gears in passenger cars and trucks. Present trends in automotive gearing toward greater pinion offset and lower gear ratios tend to cancel each other. Velocity of relative sliding is at a minimum at the pitch line. Direction of slide at the pitch line is parallel to that line. Sliding velocity and angle of slide are affected also by mean gear radius, spiral angles, and pressure angles. Average offset in passenger cars from 1946 to 1958 has increased from about 1.54 in, to 1.77 in., and in the same period the maximum offset has increased from 1.75 in. to 2.375 in. Over the same period, the average gear ratio of passenger cars has decreased from about 4.11 to 1 to about 3.31 to 1, resulting in a decrease of about 8.1 per cent in sliding velocity.

Limited slip differentials are now in use in more than 300,000 passenger cars and trucks, L. J. O'Brien, Dana Corp., told the meeting. Lubrication will involve no difficult problems because rear axle lubricants



Trend in gear ratio of passenger cars

to eliminate "G string noise," produced by very slow sliding friction of hypoid gear teeth, are also satisfactory for use in limited slip differentials. As cars become lower, greater offsets are used; larger engines give rise to lower numerical ratios in the transmission. These conditions require good stick-slip qualities in the rear axle lubricants.

Plastic Foam Insulation Saves Installation Time in Refrigerated Trailers

N 1956 when the Merrifield Trucking Co., Anaheim, Calif., decided to experiment with plastic foam insulation in its trailers, arrangements were made with the Fruehauf Trailer Co. to partially insulate a test vehicle with Lockfoam. Results were so conclusive that a complete Lockfoam insulation was developed. Physical heat reactive tests proved that the complete insulation was superior to any previous material used.

Lockfoam is now installed in the walls, floor and ceiling of the trailers and forms a complete envelope to keep out heat. It has no joints, and thus no areas that could open into air gaps. As the plastic is not affected by moisture, it retains all of its insulating qualities, and prevents rust and corrosion.

This insulation completely seals the trailer except, of course, at the door openings. Its structural strength permits a new design of trailer interior with fewer struts and ribs. Lockfoam requires only four inches of space; this adds to the payload.

Lockfoam, a gas-expanded polyurethane foam made by the Plastics Division of Nopco Chemical Co., consists of two components which are mixed and then poured or metered by machine into the cavity to be filled. A chemical reaction causes the plastic foam to expand and fill every crevice. When the foam hardens, it completely fills the voids, and bonds to the container.

To prepare for Lockfoam installation, a double



Interior view of Merrifield trailer at loading dock shows T-extruded aluminum flooring, ribbed plastic walls to route air flow evenly about the cargo and canvas duct at ceiling to distribute cold air from compressor.

wall, with a four-inch air space was devised. This was formed by the aluminum siding of the truck and a thin plastic sheet placed four inches from the aluminum. An automatic metering, mixing and dispensing machine was used to apply the foam into this four-inch space.

With the dispensing machine the operation is simple. Lockfoam is metered first into the floor of the trailer, then into the sides, and finally into the ceiling. The job is done in a single application by four men in four hours.

The optimum weight and density of Lockfoam is two pounds per cubic foot.

Each application of polyurethane foam requires careful computation of the precise amount of foaming mixture needed to exactly fill the volume to be foamed. Where large amounts are required, a series of pours is required, as a single range pour will lead to an improper fill.

Merrifield now has 10 trailers fully insulated with Nopco Lockfoam.

Ford's 10-Speed Tractor Transmission

(Continued from page 25)

operated by a separate push-pull handle, permits the operator to engage or disengage PTO machines at will with the tractor in motion. In some Select-O-Speed transmission models, the power take off has two gear ratios, giving the two standard A. S. A. E. 540 and 1000 rpm speeds. These gear ratios are controlled by a lever on the side of the transmission.

A ground drive power take off, which interprets forward movement of the tractor wheels into PTO revolutions, is provided on the two-PTO-speed transmissions.

The transmission's design provides for the addition of two side power take offs, one on either side of the tractor. These power take offs run at the same speeds as the rear PTO and otherwise conform

to A. S. A. E. standards.

All transmission clutches and bands are actuated by hydraulic pressure, directed by the selector touch control lever. The hydraulic circuit is designed so that the bands engage first with the gear sets static. The clutches then engage to transmit the power through the planetary gears. Most adjustments can be made from the outside of the tractor.

The Select-O-Speed transmission will be available in the Ford industrial tractor introduced late last year.

Red China's Expanding Automobile Industry



The Chingkanshan is the first car to emerge from the newly-formed Peking

Automobile Works



American influence is apparent in the styling of the Peace four-door sedan



The CA-11B truck, built at the No. 1 Motor Works in Changchun, is an improved version of the Soviet ZIL-150

By David Scott

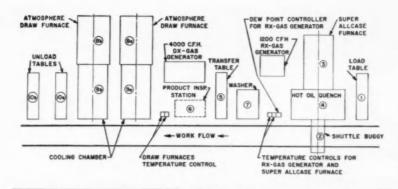
The mammoth task of putting the Chinese colossus on wheels is under way, with a profusion of prototype and batch-produced cars and trucks emerging from factories and repair shops throughout the nation. Considering that Communist China's first motor vehicle—a Russian-designed truck—was built less than three years ago, current reports that 40 different models (as well as 150 types of tractors) are now being made suggest rapid industrial advance on an unusual trial-and-error basis.

Cornerstone of the Chinese industry is the No. 1 Motor Works in Changchun (Manchuria) which was built in 1955 and tooled with modern Soviet machinery. The following year it started turning out the Liberation truck, a replica of the 4-ton Russian ZIL-150.

The "rectification campaign" introduced in early 1958 brought sweeping changes in both production program and methods. Factory engineers and workers designed and started making a new truck, stated to be a half-ton lighter but carrying a ton more payload than its Soviet predecessor. These improvements may have been a relatively simple task, however, in view of the strength-through - weight philosophy embodied in most Russian vehicles.

For the first time, too, China produced its own passenger car at Changchun. This was the Red Flag, an ambitious six-passenger model for VIPs, powered by a 200-hp engine. In May appeared the East Wind, a more modest sedan with a 70-hp overhead-valve engine and resembling a British Ford Consul in size and proportions.

(Turn to page 39, please)



1—Tray on load table loaded by operator

2—Shuttle buggy picks up load and deposits it in Super Allcase furnace

3—Load heated to hardening temperature

4—Load automatically quenched in hot oil
5—Shuttle Buggy moves load to transfer table
6—Product inspection station

7—Load washed

BA or B—Load tempered in one of atmosphere draw furnaces

9A or B—Load cooled in cooling chamber

Sequence of straight line heat treating setup

Straight Line Setup for Automated Heat Treating

N heat treating at the Harnischfeger Corp., the variety of parts is a problem and requires flexibility in equipment. Certain parts, such as large gears, rollers and shafts needed in most of the large pieces of equipment present one problem. Smaller parts found in other types of product present another. Larger parts, subject to extremely heavy shock loads, as well as static load, require the utmost in hardness and toughness. Smaller parts, requiring no less in heat treating precision, demand an easy and efficient method of handling for quantity production. Consequently, at times one or several large parts constitute a furnace load, while at others several hundred pieces may be incorporated.

A large part of the Harnischfeger production consists of pinions, gears, rollers, shafts and pins ranging up to six in. in diameter. Alloy steels in the 4100 and 4300 series, as well as cast steels of similar compositions, are used. Normal hardening temperatures range from 1500-1600F. Carburized parts produced from 8600 and 4300 series steels are similarly heated.

To handle the variety with ease and flexibility a Super Allcase controlled atmosphere hardening furnace, a spray washer, two con-



Typical parts heat treated at Harnischteger

By F. V. Horak, Manager

Metallurgical Operations

HARNISCHFEGER CORP.

Milwaukee, Wis.

trolled atmosphere recirculating tempering furnaces, and two atmosphere generators are installed. This equipment was built by Surface Combustion Corp.

The Allcase furnace is of the enclosed quench type and completely automatic. The furnace heating chamber, heated by suction type radiant tubes, has a work space of 30 in. wide, 48 in. long and 18 in.

high. A roof fan circulates the atmosphere gas around the tubes and through the work load. Although primarily used for clean hardening, the 1800F maximum temperature range makes it available for carburizing purposes as well. The necessary enriching panel with automatic valves and flow meters is an integral part of the furnace.

Hot oil is circulated within the enclosed quench tank, and through coolers to maintain temperature control throughout quenching. Propellor agitators provide forced oil circulation around and through the load affording a better and more effective quench.

A 1200 cfh Surface RX gas generator supplies the necessary atmosphere for this furnace, as well as for a large radiant tube pit furnace installed near by and used for similar purposes,

To further minimize operator attention, a Surface Autocarb, automatic signalling dewpoint controller, monitors the RX gas generator and provides a constant analysis atmosphere at the hardening furnace.

This combination supplies and controls a furnace atmosphere which permits a furnace production of an average of 460 lbs of net work per hour substantially free of surface decarburization. The enclosed quench insures freedom from surface oxides or scale.

Tempering of the hardened parts is carried out in either of two identical tempering furnaces having an operating range of 400F to 1250F.

The vestibule used for charging and discharging the furnace is provided with an overhead cooling chamber. This feature permits

(Turn to page 63, please)



Reinforced plastic milk tank built by The Heil Co. The manufacturer uses the Frigid-Lite molding process which produces a completed one-piece unit in a single operation, similar to a casting.

High Spots at the Reinforced Plastics Conference of the SPI

Reinforced plastics are providing many structural parts for missiles subjected to temperatures above the melting point of refractory metals, and in many cases are outperforming metals, the 14th Annual Reinforced Plastics Conference of the Society of the Plastics Industry was told. The meeting, held in Chicago last month, also heard discussions of structural applications of reinforced plastics in automobiles, trailers, cargo containers, and tooling, with many examples on display at the exhibit held in connection with the conference. About 16 per cent of 1958's reinforced plastics totaling 185 million lb went into the transportation industries, plastics producers reported; 10 per cent into aircraft and missiles.

J. T. O'Reilly and H. L. Wyatt, Ford Motor Co., reported that about \$2-million was saved during the 1958 model change by use of plastics die models, checking fixtures, and prototype tools.

Molders of reinforced plastics structures reported the use of a percentage of acrylic resin, about 15 to 20 per cent, with polyesters to improve the finish of the piece from the mold. This is of importance to molders of automotive parts. Use of a gelcoat on the mold surfaces before the introduction of the resin serves the same purpose, but keeps all the coating at the surface of the molded piece.

Top award at the exhibit went to the all-plastics truck cab used by White Motor Co., and made by Molded Fiber Glass Body Co., Ashtabula, Ohio. This is an assembly of 35 molded pieces, joined mostly by adhesive bonding.



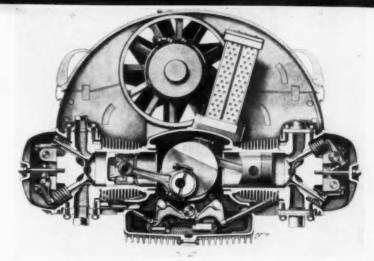
Three of the nation's top industrial designers give the Grand Merit Award to an all-plastic white truck cab at the Exhibit. Judges are II. to r.] Dave Chapman, president of the Chicago industrial design organization, Dave Chapman, Inc.; John M. Sherrer, senior associate of J. O. Reinecke and Associates, industrial design firm headquartered in Chicago; and Jon W. Hauser, executive vice-president and general manager at Chicago office of Raymond Loewy Associates, Inc.

Heil Co., Milwaukee, had on display outside the building one of its new rectangular 4300-gal trailer tanks, claimed to be the largest one-piece molding of sandwich construction. The rectangular form is easier to mold, and so can be priced competitively with steel, Heil representatives stated.

Austrian Version of Fiat 500

HE Austrian Steyr-Daimler-Puch concern has been producing under license various Fiat models during the last few years and has designed a new 2.3 litre high-performance engine for the 1400 and 1900 Steyr Fiat variants.

With the arrival of the small Fiat 500 an Austrian version of this car has been prepared in the Puch plants near Graz. Body panels and front suspension units are supplied by Fiat, but a new engine, transmission, and rear suspension



Steyr-Puch engine which powers the Austrian version of the Fiat 500

line have been designed by the Austrian concern. Instead of the Fiat vertical twin, a flat twin, aircooled, four-stroke engine is used. It has a bore of 2.75 in., stroke of 2.52 in., and displacement of 30 cu

in. Maximum bhp is 16 at 4600 rpm. The transmission has four forward speeds with wider ratios than the Fiat 500 and synchromesh instead of dog clutches on the upper three ratios.

Red China's Expanding Automobile Industry

(Continued from page 36)

Now the Chinese are even offering it for export, and an advertisement in one of their English-language magazines describes it as a "medium-class car combining quality with distinctively Chinese elegance." Trucks and buses from this plant are also advertised.

While at present this may be regarded as more of a prestige gesture than a serious export threat, production at Changchun is expanding rapidly. Output was reportedly more than doubled last year, when 70,000 cars and trucks were produced. The new plan calls for an annual figure of 150,000 vehicles by the end of 1959—the target originally set for 1967.

Such swift growth, the Chinese claim, stems from the process of "rectification," which involves mass participation of workers in management, encouragement of suggestions for rationalizing production, and especially the economic use of machinery in relation to the abundant labor supply. Reversing the trend in western factories and apparently departing even from the Soviet pattern, Changchun is

adopting techniques used in smaller plants where local peasant labor is harnessed on a vast scale.

It has built and installed many simple, single - purpose machine tools for making a number of the basic components, releasing existing complex and automatic units to produce more involved workpieces. In addition, there are experiments with a four-shift day on a "study while you work" arrangement. Under this, employees have a ten-hour day, working six and studying four.

The lessons of Changchun are being applied to other automobile factories, which are mostly derived from small-scale engineering plants and repair shops. The Peking Automobile Works is one of these aggregates, made up of shops formerly devoted to vehicle assembly and repair and to making farm machinery, and now integrated for the manufacture of cars, trucks and tractors. One of the first models to appear is the two-door Chingkanshan.

Similarly, the small Hsinchien Machine Works at Chungking has begun making cars, with the 95-hp Progress sedan as its initial embryonic effort. The process of creating grass-roots motor plants all over the country is officially fostered, and it is understood that Tibet is now the only region not producing road vehicles of some description.

Consolidation is likely in the future, however, as technical experience is gained and the basic machine-building and metallurgical industries develop. A pointer to the further expansion of China's vehicle output is the spectacular increase in steel production, resulting from the mushrooming of thousands of rural and even primitive mills manned by peasants during off-season farming periods.

According to official claims, China's output of crude steel rose from 1.35 million tons in 1952 to 5.35 million tons in 1957, while last year it is estimated to have jumped to over 11 million tons. On this basis, China has overtaken Japan to become the world's sixth largest producer. At the same time, its annual capacity has risen to some 25 million tons, and if this figure is realized in 1959 it will move into third place, behind only America and Russia.



AUTOMATIC CONTROLS

PRODUCTION-VEHICLES-AIRCRAFT

By Samuel Cummings

TAPE-CONTROLLED COMBINATION MACHINE

Kearney & Trecker Corp. announced development of a new tapecontrolled combination machine that changes tools automatically. The company said the new machine "bridges the gap between job shop mechanization and automation."

The new machine, called Milwaukee-Matic can perform milling, drilling, reaming, tapping and boring operations. Both machine and control system will cost about \$120,000, Kearney & Trecker said.

As many as 31 different tools

can be loaded into the machine at the same time—30 in a specially designed revolving storage drum and one in a spindle.

Tool changes are made as follows: A transfer arm automatically removes the tool from the spindle and a new tool from the drum; then rotates and simultaneously inserts the new tool in the spindle and the old tool in the drum. All this takes less than nine seconds.

The numerical control system, designed for the machine by General Electric, makes the tool selection and directs the workpiece transfer. The tools carry a binary code and thus can be placed in any position within the drum regardless of the sequence in which they are to be used. Mechanical "fin-

gers" feel the tools and signal the control to stop the drum when the right tool is in position to be picked up by the transfer arm.

The GE system not only directs tool changing and positioning of the worktable and spindle, but also controls spindle speed, feed rate, and such functions as turning coolant on and off.

TRANSACTOR SYSTEM

A new electronic system that automatically collects production data from any point in a company network and feeds it to a data processing system has been announced by Stromberg Time Corp., of Thomaston, Conn.

Stromberg's Transactor system is made up of two standard elements: Transactor units which gather information at remote points and transmit it to the Compiler, which is located in the central processing office.

Data are fed into the Transactors by prepunched cards, numerical dialing, or coded keys. The Compiler decodes signals received from the Transactors and punches out the data on paper tape. The output tape can be fed directly into communications systems, automatic typewriters tape-to-card converters, or computers.

The first production unit of the Transactor system has been installed at the United States Naval Gun Factory in Washington, where it will be used together with an IBM 650 computer to simplify manufacturing control.

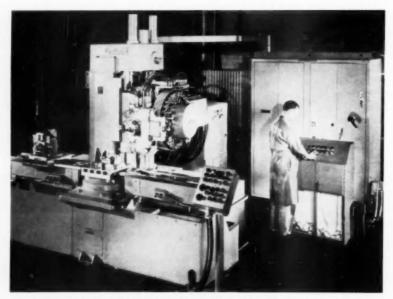
ULTRASONIC TOOLING

A new extension-type tooling device that shoots ultrasonic energy around corners has been developed by Sheffield Corp., Dayton, O.

The new device, which operates multiple machining stations from a single transducer, has upped production of Sheffield-Cavitron ultrasonic machine tools as much as 40 times on some applications, Sheffield reported.

The new tooling transmits ultrasonic energy through curved cylindrical rods to remote stations located at any angle to the transducer. Each station has one rod

(Turn to page 54, please)



New K&T combination machine is equipped with GE control system. Operator is shown at GE console control.

News of the MACHINERY INDUSTRIES

___ By Charles A. Weinert _____

Allis-Chalmers Has a Continuing Equipment-Replacement-Program in Effect and Uses the MAPI Formula for Measuring the Cost Advantages of Proposed Machines

Leading Manufacturer Has Replacement Program, and Likes MAPI Formula

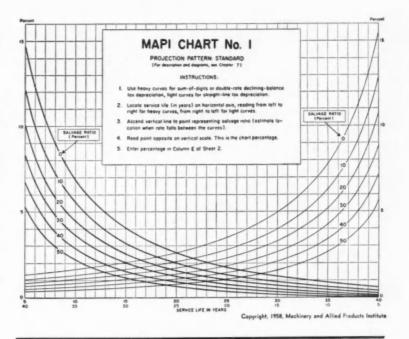
It is now more than ever essential for management to recognize the importance of a modern, effective capital-equipment replacement program—and the MAPI formula is a scientific approach to the problem—Frank Zoeller, Allis-Chalmers Mfg. Co., told the Industrial Management Engineering Conference, held recently at Illinois Institute of Technology.

The 1954 tax law, by introduction of two other options for purposes of tax depreciation, permitted charging off a higher proportion of a machine's cost during its early more-productive life. Allis-Chalmers has adopted one of these—the "sum-of-the-digits" method.

At Allis-Chalmers all maintenance costs on machine tools are charged to the departments in which the machines are located; and then, by transfer posting, the charges are entered, in each case, on the tool record card. By calling attention to excessive costs, these cards help to pinpoint machines for replacement or rebuilding.

All machines are placed in two categories: the "A" group immediately considered for replacement; the "B" group not requiring immediate analysis. In the "A" group are those machines that have shown excessive maintenance costs, or which have been out-dated by more efficient equipment. The "B" group includes equipment as efficient as can be obtained, or single-purpose machines that will serve for the life of their scheduled parts production.

Planning and time study departments prepare the capital equip-



ONE OF MAPI'S NEWEST GRAPH CHARTS

As part of its revised capital-equipment-investment analysis formula introduced last year, MAPI developed three graph charts for the deterioration-obsolescence factor. The Standard one lillustrated) is a constant-rate accumulation like that of the old formula. Variant A projects a slower accumulation at first than later; Variant B, a faster initial accumulation than later. Also added is provision for applying the particular method of tax depreciation employed. As an end result, the latest formula gives the after-tax rate of return on net new investment in the form of an "urgency rating." Next-year's after-tax gain in dollars is also available from the computation.

ment replacement analysis that is used to compare proposed new equipment with old equipment. If an appreciable advantage is shown for the new equipment, the analysis is submitted to management along with a request for the expenditure. Where the analysis shows that it is not advantageous to replace, repairs or rebuilding are normally considered.

Allis-Chalmers uses the MAPI

formula and takes into account many factors in making these equipment analyses. Direct labor costs are compared for the proposed and existing equipment, based on the same anticipated production from both. Spoilage expense is considered; machine downtime estimated from records on existing equipment; relative power consumption determined; tooling

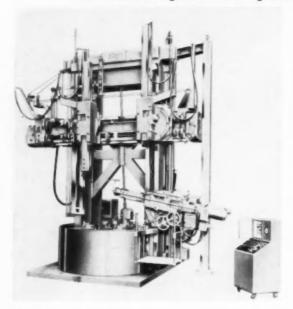
(Turn to page 54, please)



PRODUCTION EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card at back of issue

Vertical Boring and Turning Machines



Pictured is a King custom-built vertical boring and turning madesigned meet specialized production requirements, while retaining all standard facilities for general - purpose ma-chining. The grinding attachment with multi-speed precision motorized spindle ex-tending through side ram is arranged to receive interchangeable guills. The attachment includes balancing type wheel holders and wheel guard with exhaust outlet. (American Steel Foundries, King Machine Tool Div.)

Circle 35 on postcard for more data

operation, the profile of the mandrel has been reproduced in the ID of the part and the hardness, tensile strength and surface finish have all been improved. ID profiles produced by the machine range from internal shapes on which close tolerances are not required to the highly accurate lands and grooves in rifle barrels.

Circle 36 on postcard for more data

Swivel-Base Chucks

THE O. S. Walker Co., Inc., announces a line of permanent magnetic chucks with swivel bases. The design allows tilting of the chuck and work piece to 45 degrees right or left of center. Exact position is set directly from an integral graduated

The bar poles, ¼ in. wide, give uniform holding over the entire chuck



O. S. Walker swivel-base chuck

top. In the "Off" position, the chuck is completely demagnitized.

Circle 37 on postcard for more data

Chromium Plating Barrel

M ETAL & Thermit Corp. has developed a completely automatic continuous chromium plating barrel. The device needs attention only for feeding parts and for the removal of plated parts from a tote box.

It is designed so that dry and burnished parts are put into one end of the machine and are fed automatically into the plating barrel which has specially designed baffles to assure plating without contact marks. Timing is automatic and can be adjusted for thickness of plate desired and number of parts being plated at any time.

Circle 38 on postcard for more data



Cincinnati Intraform uses a set of four forming dies which pulsate rapidly while revolving around the OD of the workpiece.

Machine Rapidly Produces Complex ID Profiles

NEW process of "chipless" machining has been announced by the Meta-Dynamics Div. of the Cincinnati Milling Machine Co. With the Cincinnati Intraform show above, profiles on the ID of cylindrical workpieces can be formed quickly and easily without the need for expensive tooling.

Hollow cylindrical stock is placed over a mandrel and squeezed by pulsating dies. At the completion of the



Diluted cutting oil can pile up rejects

When you find your scrap production soaring, the villain may be lube oil leaking into the cutting oil sumps of your automatic screw machines. It happens in 7 out of 10 automatics in spite of the most careful lubricating techniques. This dilution will lower cutting oil effectiveness—and, as it loses its efficiency, rejects pile up, tool life drops, and production can go down by as much as 33 per cent!

Texaco Cleartex can solve the problem-forever!

Because of its exceptional stability and load-carrying ability, Cleartex can function both as a cutting oil and as a lubricant—and even as a hydraulic fluid. When all your automatics' sumps are filled with Cleartex, unavoidable leakage is no longer a problem. Excessive scrap production will stop, tools will last longer and production will go up.

TAKE THE "CLEARTEX CURE" SOON!

Write today for your copy of Texaco's new booklet—"Cleartex in Automatic Screw Machines." This new illustrated guide will fill you in on the details, show you where you may be losing profits and how to avoid it. Or contact your local

Texaco Lubrication Engineer for an authoritative survey of your automatics. Just call the nearest of the more than 2,000 Texaco Distributing Plants, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y., Dept. AI-30.

TUNE IN . . . Metropolitan Opera Radio Broadcasts Saturday Afternoons—CBS



LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)

PRODUCTION EQUIPMENT



Kingsbury automatic units feature long strokes with cam feeds. Each unit has a positive drive with friction safety clutch and a rotary pump supplies a continuous flow of oil.

Automatic Units Feature Long Strokes With Cam Feeds

QUILLS are fully extended on these automatic units to show available strokes—four inches on the 4 and 5 units, five inches on the 16 and 17 units. Models 4 and 16 are drilling units, 5 and 17 are companion tapping units.

Each unit has a cam feed for accurate repetition of the work cycle. Follower segments make the stroke of the spindle double that of the feed cam. Different speeds, feeds and strokes are available by changing speed and feed gears and the feed cam.

Each drilling unit may be converted to its companion tapping unit by using a different feed cam, a reversing motor and controls to reverse them. The tapping units can have time cycles as short as three seconds.

Controls may be either air or electric and are interchangeable. Units may be mounted horizontally, vertically or at angles. A dovetail base on each unit fits into a mounting adapter of the desired height with a screw for lengthwise adjustment. Kingsbury Machine Tool Corp.

Circle 39 on postcard for more data

Twin shell molding machine equipped with three Rotac torque actuators for shell molds

Twin Shell Molding Machine Makes Finished Shell Molds

U SING three standard Rotac torque actuators, made by Ex-Cell-O, the machine illustrated produces finished shell molds, alternately on two

stations. This machine produces molds for two different jobs at the same time. It can run with either station inoperative and does not require skilled labor. The machine is made by Shell Process, Inc.

A standard HN-63-IV Rotac torque actuator is operated at varying pressures up to 800 psi and is used to rotate investment chamber 180 degrees, and to return it at the end of cycle. Two standard HN-63-1V rotac torque actuators are used to swing patterns from investment to ejection stations. This application follows the best design practice utilizing separate outboard bearings to take heavy radial loads, external stops, and smoothly decelerates movement of mass by cams which close a valve to stop the movement gradually in each direction. The circuit also includes relief valves set to limit the pressure which can build up within the actuator and other circuit members. Ex-Cell-O Corp.

Circle 40 on postcard for more data

Horizontal Unloaders



Pictured is a small compact horizontal unloader recently added to the Sahlin Engineering Co. line of press automation equipment. For versatility, jaw components are interchangeable with standard Sahlin Hand jaws.

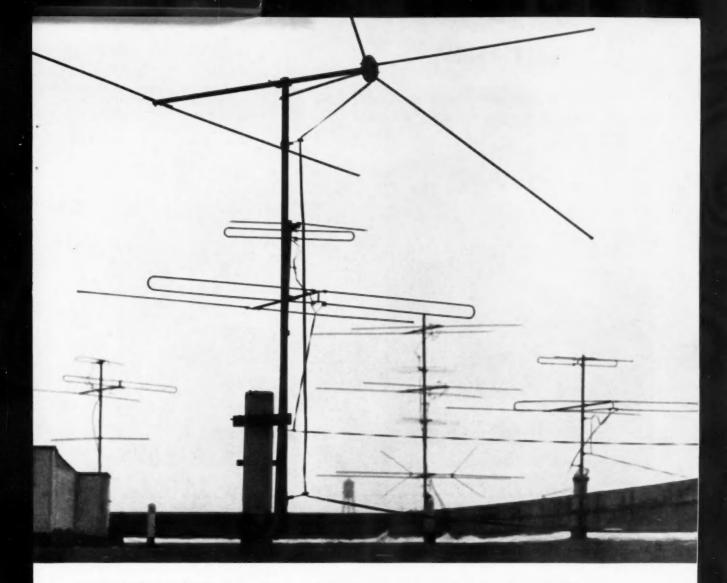
Circle 41 on postcard for more data

Rupture Testing Machine

U NIFORM loads are applied and maintained indefinitely with an air operated creep-stress rupture testing machine developed by the Tinius Olsen Testing Machine Co. Variable loads to 12,000 lb are applied without shock and maintained regardless of normal fluctuations in line pressure. Load is indicated by either of two precision gages—one for the low range of 0 to 3000 lb and the other for the high range of 0 to 30,000 lb.

Specimens may be tested at any temperature from 0 to 1800 F or 2000 F, which is automatically maintained by an electrically operated furnace, which swings in or out of the testing area.

Circle 42 on postcard for more data



WHICH ONES WILL LAST (and last, and last!)? THOSE MADE OF WEIRKOTE® ZINC-COATED STEEL!

Steel tubing that's protected against corrosion even under the most trying circumstances. Steel tubing that's easily fabricated to meet the most exacting specifications.

That's what you get in tubing made of Weirkote zinc-coated steel!

Weirkote's zinc coating—applied by the continuous process throughout, and so uniformly that every square inch is protected—is skin-tight. There's absolutely no flaking or peeling no matter how tortuous the crimping, twisting or other stresses of fabrication. In fact, Weirkote can be worked to the very limits of the steel itself.

The use of Weirkote can eliminate the need for any further coating process after fabrication. Its tight zinc coating is completely intact and remains so during fabrication and on the job. Weirkote zinc-coated steel tubing is particularly suited for jobs where weather is a factor to be taken into consideration.

Take a good long look at the possibilities <u>and</u> advantages of using Weirkote zinc-coated steel to meet your tubing requirements. For the complete story on Weirkote and how it can help you, write Weirton Steel Company, Weirton, West Virginia.

Circle 111 on Inquiry Card, for more Data



WEIRTON STEEL COMPANY

WEIRTON, WEST VIRGINIA

a division of



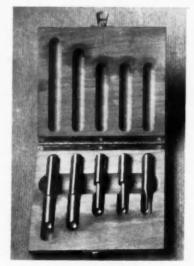
Vertical Machine For Chipless Metal Forming



The No. 12 vertical Floturn machine is specifically designed for "chipless" metal forming of parts ranging up to 16 in. in diameter and to 15 in. in length. The high production machine features an automatic cycle which may include automatic loading and unloading. The vertical design incorporates radion,
"Dual-Synchro" rollers which virtually eliminate deflection and assure Automatic accuracy. hydraulic tracer control is provided to make production complex shapes a pushbutton" operation. The machine produces conical, cylin-drical, contoured shapes or combinations of these shapes from flat blanks, preformed blanks or machined blanks. (The Lodge & Shipley Co.) Circle 43 on postcard for more data

Carbide Boring Bars

A LINE of carbide boring bars featuring solid carbide heads, permitting them to be re-sharpened for maximum tool life is available. Constant clearance throughout the life of the tool is assured, since it is sharpened by grinding only the cutting face. The cutting head is double-



Titan carbide boring bars

brazed, both at the point of contact and at the center of the head. Thus, the head cannot come loose.

The line is available in sizes from 1/8 to 3/4 in., in shank sizes of 3/6 or 1/2 in., with tips ground for boring or facing. Titan Tool Supply Co., Inc.

Circle 46 on postcard for more data

Vernier Magnifier

ACCURACY in reading all vernier scales is possible with this vernier magnifier which has application for machinists, engineers and toolmakers. The clear plastic body of the mag-



Bausch & Lomb vernier magnifier

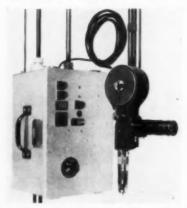
nifier is designed to admit available room light. Two permanent alinco magnets are embedded in the base for attaching to metal scales. The B&L magnifier provides clear, sharp enlargement of scale lines for easier, more exact readings. Bausch & Lomb Optical Co.

Circle 47 on postcard for more data

Welding Torch

Por consumable-electrode inert-gas metal-arc welding, this Sigmette torch combines portability and easy maintenance.

The wire spool mounted right on the torch lets the operator get at jobs in confined spaces and areas remote from power and gas supplies. Designed for welding jobs where portability of equipment is required, the torch weighs three pounds, the control



Linde portable Sigmette welding torch

box less than 20. The torch is rated at 300 amps.

Torches are available for the full welding range with either 0.030 or 1/16 in. aluminum wire. Linde Co., Div. of Union Carbide.

Circle 44 on postcard for more data

Control System

A CONTROL system, adaptable to many high-speed continuous operations requiring accurate and complex monitoring, has been designed to cut labor costs and increase machine efficiency in production of items such as machined and stamped automotive products.

The device is a simple fail-safe pulse system, either photo-electrically or magnetically operated, in which phasing determines accuracy or inaccuracy. It is applicable to any operation requiring multiple, perfectly-aligned simultaneous signals, and can be adapted to many multiple die-cutting operations. Sterns Control Corp.

Circle 45 on postcard for more data

Hydraulic Cylinder Manufacturer Specifies



Loading a minimum quantity of Ostuco tubing at the Shelby mill — in this instance only 150 feet.

66 When you make hydraulic cylinders in 11 bore sizes...dozens of different pressure ratings...a variety of wall thicknesses and analyses — you've got a man-size tubing inventory problem.

"That's why we switched to Ostuco tubing made to our exact specifications. We like its availability in truly small minimum quantities. And with its consistently close tolerances, shipment after shipment, Ostuco tubing has cut our machining time over 50 percent...

This is an actual case history of a manufacturer with a severe inventory problem. He required special tubing grades in minimum quantities. If you're faced with a similar situation, it's time you contacted your Ohio Seamless representative, listed in the Yellow Pages, or the mill at Shelby, Ohio—Birthplace of the Seamless Steel Tube Industry in America.



OHIO SEAMLESS TUBE DIVISION

of Copperweld Steel Company · SHELBY, OHIO

Seamless and Electric Resistance Welded Steel Tubing . Fabricating and Forging

SALES OFFICES: Birmingham, Charlotte, Chicago (Oak Park), Cleveland, Dayton, Denver, Detroit (Huntington Woods), Houston, Los Angeles (Lynwood), Moline, New Orleans (Chalmette), New York, North Hansas City, Philadelphia (Wynnewood), Pittsburgh, Rochester, St. Louis, St. Paul, St. Petersburgh, Salt Lake City, Seattle, Tulsa, Wichita GANADA: Railway & Power Engr. Corp., Ltd. EXPORT: Copperweld Steel International Company, 225 Broadway, New York 7, New York

Internal Lapping Arrangement for Air Brake Parts



Lapmaster Model 24 shown above is equipped with a five station lapping attachment for lapping of air brake valves and other air equipment. This radially mounted fixture permits lapping of valve faces on lapping table while reciprocating blocks internally lap valve seats. (Crane Packing Co.)

Circle 48 on postcard for more data

drically ground steel alloy shaft operating within an extra long selflubricating bearing. Rapid adjustment for depth of cut is made by merely retracting and rotating the spring-loaded thimble to any desired position. Precise machine-cut serrations provide positive locking. Final cut is accurate within ± 0.001 in. Schrillo Aero Tool Eng. Co.

Circle 51 on postcard for more data

Packagina Machine

A MACHINE for packaging long, irregular objects in a wide variety of shapes has been announced by Sundstrand Machine Tool Co.

Named the Packmaster Model 56, the machine handles objects from 1/4 to 2 in. thick, and packages them in cohesive paper up to 12 in. wide.

Parts are placed between sponge rubber rollers and fed automatically through the wrapping, cut-off and marking stations and the finished wrapped part is then ejected into a shipping container or onto an exit belt. Machine speed is adjustable from 0 to 120 fpm by means of a variable speed drive. Sundstrand-American Broach, Div. of Sundstrand Machine Tool Co.

Circle 52 on postcard for more data

"Cold Point" Drill

Mossberg, Inc., has designed and developed the so-called "coldpoint" drill which features: the use of a carbide insert at the top of the drill; a single oil passage through the drill and shank; and adoption of negative rake for the cutting edges

When the carbide insert is fitted in place it breaks up the oil hole at the tip into two oil passages, one on each side of the cutting edge. In using the drill it is necessary to provide a package attachment, consisting of an oil pump and reservoir. This is done to provide oil pressure ranging from 40 to 125 psi to the drill, the pressure being varied in accordance with the requirements of a specific job. Fluid under moderate pressure serves not only to wash away the chips but to keep the point cool at all times.

The drill is said to be capable of drilling the gamut of "exotic" metals and alloys at high rates of feed. It goes through tough boiler plate in seconds, producing a fine finish. It is claimed that the drill makes it possible to obtain fine surface finish and to hold unusually fine tolerances. The drill also has use in producing deep holes-those that usually gun and part-way drilling-in a single pass.

Circle 49 on postcard for more data

Billet Heater

A NEW induction billet heater which provides an improved control system for heating aluminum billets to precise temperature for extrusion is offered by the High Frequency Heating Div., Lindberg Engineering Co.

The system measures watt-hour input to the billet with an integrating watt-hour meter and determines, with a totalizer timer, the amount of energy absorbed by the billet. A means of compensating for the starting temperature of the billet is provided. Thus, with a billet of known weight and temperature, a predetermined amount of energy can be selected to heat the billet to the desired extrusion temperature. No prod type thermocouple is required.

. Circle 50 on postcard for more data

Countersink Tool

THE Schrillo fully-adjustable Micrometer-stop countersink is a fast - cutting, light - weight hand tool used to deburr, produce internal chamfers or countersink to precise depths. It may also be used on lathes or drill presses.

It features a hardened and cylin-



Schrillo countersink tool

Air Pressure Regulators

MALL pressure regulators, 3 1/32 S in. high by 1% in. hex, for air, water and non-corrosive gases and liquids are available in 1/8 and 1/4 in. N.P.T. pipe sizes.

The series 20AR regulators handle air flows up to 20 cfm at 100 psi air pressure and provide reliable pressure regulation even with widely fluctuating line pressure and rapidly varying air flow. They can be used at a maximum primary pressure of 400 psi and a maximum delivery pressure of 100 psi. Maximum operating temperature is 200 F. C. A. Norgren Co.

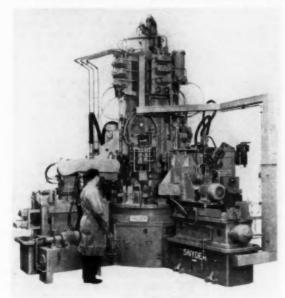
Circle 53 on postcard for more data

Forged Steel C-Clamps

FEATURING a swivel pad that is guaranteed never to come off, a line of forged steel C-clamps offers extra-deep throats and heavy, sturdy spindles. The line will be available in 2, 3, 4, 6, 8, 10 and 12 in. capacities, with minimum proof tests from 2700 to 8000 lb. Proto Tool Co.

Circle 54 on postcard for more data

Center Column Machine Handles Variety of Parts



Snyder special center column machine of the double index type which machines a variety of cast iron and aluminum bodies. The unit is hydraulically operated, electrically controlled and has separate pump and tank units that provide the hydraulic power. The table is also indexed hydraulically by a mech-anism built into the machine.

THIS Snyder special center-column type transfer machine tool is designed to process a variety of cast iron and aluminum pump bodies at a production rate of 100 parts per

Differences in part materials are compensated for by providing all machine heads with change gear boxes. The drilling and tapping head spindle speeds are increased for aluminum parts by reversing a pair of gear drives. Milling head cutter speeds are changed by reversing a pair of drive pulleys. Snyder Machine Tool Co.

Circle 55 on postcard for more data

radius and 6 in. long can be inspected on the unit, which uses a bench space of 32 by 26 in. Irregular shaped parts requiring precise measurement can be also inspected. The cam is located between centers of the table and tailstock. After adjustments are made with the rotary index table and axial micrometer, the fiducial indicator stylus is brought into contact with the cam at the starting point by adjusting the front micrometer until the float in the column Precisionaire is at zero. The cam is then advanced to the next inspection point. Then, the float in the column instrument is returned to zero and the micrometer read for amount of deviation

Radial and axial movements can be made to an accuracy of 0.00001 and angular position to within plus or minus six seconds of arc throughout the entire 360 degrees. The Sheffield Corp.

Circle 56 on postcard for more data

Riveting Machine

THE Model 110A riveting machine automatically feeds and sets semitubular rivets up to 5/16 in. diameter and 18/16 in. long. It has a standard throat depth of 10 in. A feature of the unit is an eccentric actuated toggle linkage attached directly to the spindle. This mechanism enables the



Sheffield three dimension cam measuring used on this machine have an accuracy of plus or minus 0.000010 in. per inch.





machine to develop a maximum force through the rivet setting range, and eliminates most of the vibration and jar. Tubular Rivet & Stud Co.

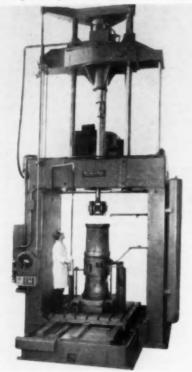
Circle 57 on postcard for more data

Three Dimension Cam Measuring Machine

This Precisionaire measuring machine is for inspecting the contour

of two and three dimension cams. Three dimension cams up to 3 in.

Heavy Duty Honing Unit Finishes Cylinder Liners



Barnes heavy duty honing machine finishes heavy duty cylinder liners. In a typical application it is used for honing 14 to 19.5 in. diameter cast-iron cylinder liners, 70 in. in length. Stock 0.010 in.—0.020 in. is removed and a finish of 7 to 32 rms produced.

This heavy duty machine is designed for honing large bearings, cylinders, cylinder liners, Diesel parts, compressor cylinders, etc. It provides a capacity range up to 36 in. in diameter and 72 in. in length and is

equipped with a 30 hp motor on the head. There is a 20 hp motor on the hydraulic units. It is also equipped with pneumatic hone expansion and an 80 in, stroke, Barnes Drill Co.

Circle 58 on postcard for more data

Comparator

THE Model A comparator can be adapted to many types of dial indicators. It can be equipped with an adapter to accommodate any dial indicator with a conventional back.

An aluminum base makes the Model A light in weight and easy to handle. Coarse adjustment is made by sliding the indicator mount up and down the column and clamping in position. Fine adjustment is then made by rotating the left-hand knob in either direction and locking in position with the right-hand knob.

The stage is adjustable and reversible from front to back and, by rotating 90 degrees, from side to side. It also has a % in. hole for mounting post-type anvils. Vertical capacity above the anvil is 3% in. Petz-Emery, Inc.

Circle 59 on postcard for more data



Petz-Emery Model A comparator

Static Power Inverter

A SOLID state static power inverter, utilizing transistor and magnetic amplifier circuitry to convert an 18-30 vdc source to a 115 v, 470 cps, single phase ac source, has been developed by Magnetic Ampli ers, Inc.

Created for use in missiles, aircraft and ground equipment, the inverter also has applications in the fields of automation, atomic energy programming, and in ignition systems. Its output is stabilized in voltage and frequency for wide variations of input voltage, load, load power factor and ambient temperature.

Circle 60 on postcard for more data

Improved Groove Gage

THIS gage is designed to simplify and speed up precision measurements of grooves. It can be used for a wide range of internal and external measurements including Snap



Mueller gage simplifies groove measurement.

Ring, Truarc and O-ring grooves.

Readings are taken directly from a solidly mounted dial indicator calibrated in 0.0005 in. The Mueller Gages Co.

Circle 61 on postcard for more data

Mobile Cooling Units

THE Young Radiator Co. has announced the development of a line of mobile cooling units designed to control temperature and to circulate hydraulic oils or electronic cooling fluids such as fluorochemicals. Units are available with either water or air-cooled heat exchangers.

Completely equipped, they can be furnished with pumps having special Teflon seals for low viscosity fluids. Casters are equipped with locks and the units will pass through standard size doors.

Circle 62 on postcard for more data

Tool Detector

A TOOL detector has been developed to eliminate separate probe and inspection heads and stations. It prevents processing of "scrap parts" and, by signaling the control panel and shutting down the machine when one tool breaks, prevents additional tool damage.

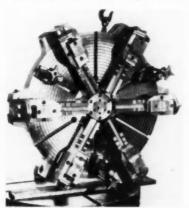
Designated the Protect-O-Tool, this device is an electronic mechanism that senses the presence or absence of a tool or even a part of a tool in cases where a small piece of a drill or tap breaks off and remains in the work piece. The device is mounted on bushing plates behind the regular drill bushing hole. Tool detection occurs as the drill or tap passes through the detector before and after machining. The Cross Co.

Circle 63 on postcard for more data

Universal Type Chuck

This 30 in. diameter universal chuck enables the user to control chucking pressure on the workpiece. It also features jaws which open wide for easy loading and unloading, rapid set up and change over, and extreme accuracy.

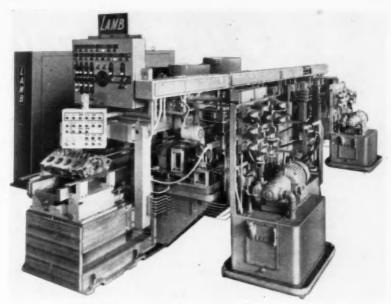
The chucks will accommodate gears, rounds, and odd-shaped parts. False jaws may be made by the user to handle additional parts if necessary. The jaws pull the workpiece back into the chuck against positive rest stops. Since chucking pressure can be controlled, parts may be chucked with a feather-light touch, without distortion. The same chuck may be used



Garrison controlled pressure chuck

to round-up parts, which have become distorted in heat treat, simply by increasing the chucking pressure. Garrison Machine Works, Inc.

Circle \$4 on postcard for more data



F. Jos. Lamb machine automatically assembles welch and pipe plugs in blocks

Unit Assembles Welch and Pipe Plugs in Engine Blocks

THIS 9-station transfer type machine applies sealer, assembles eight welch plugs and runs four pipe plugs to depth in 121 engine blocks net per hour. All operations are completely automatic.

The machine is a self-sufficient unit and can be used separately or incorporated into any block processing line. The first station is equipped to accept blocks that are loaded automatically or manually.

Sealing compound is fed from a central pressurized tank through the spindles and applicator quills. Each spindle is equipped with a metering unit, and compound is applied through the rotating quill in a single bead around the seat. F. Jos. Lamb Co.

Circle 65 on postcard for more data

Indexable Inserts

C ARMET indexable inserts are cemented carbide blanks designed to be mechanically held in special holders for the turning of steel and other materials.

The inserts feature a mirror finish which reduces chip friction and cratering, thereby increasing tool performance and tool life. The finish is made by lapping the inserts with a superfine grit wheel and the cut metal slides more quickly away from the cutting edge. Allegheny Ludlum Steel Corn.

Circle 66 on postcard for more data



H. B. Rouse high speed hand miller

other materials. Conversion into an accurate, high speed burring machine is simple. It is only necessary to increase spindle speed to 10,000 rpm, attach a high speed carbide burr to the output shaft and to adapt a fixture to accommodate the piece. H. B. Rouse & Co.

Circle 67 on postcard for more data

High Speed Burring Unit

The Rouse hand miller is a high speed, ball bearing motor driven machine for handling light cuts in brass, aluminum, steel, plastics and

Observations

By Joseph Geschelin

Filter Needed

Based upon volume production experience, we were told recently by one of Ford's process engineers that gear shavers and similar equipment which produce very fine metallic chips require special care in filtering the coolant. They have installed Barnes magnetic separators on such items but recommend the addition of a good paper roll type filter such as Delpark to produce an adequate job. Such precautions are a must when dealing with fine finishes and close tolerances.

Seldom Unique

The truism that "there is nothing new under the sun" was brought home to us in a recent note from Young Radiator. Touching on chassis dynamometers for simulating road conditions in the laboratory, Fred M. Young drew our attention to the fact that back in 1921 they built a dynamometer for this purpose. At the time they were interested primarily in testing a replacement Ford radiator for resistance to vibration. In this rig they fastened the rear axle securely to the bed of the machine, drove the front wheels of the car by engine power. The front wheels were forced to vibrate by contact with large wheels or rollers to which blocks were attached. It is interesting to learn of such early engineering developments because of their influence upon more advanced practice.

Quincke Tube

One of the speakers at a recent aircraft hydraulic meeting described the application of the Quincke tube in the hydraulic system of a new airplane. It is easier

to sketch than to describe. In any event, it consists of two unequal lengths of tubing, the ends of both branches being coupled to Tee-fittings. It is used to eliminate pulsations in hydraulic lines arising from high pressure pump action. This starkly simple solution stems from work done by a Dr. Quincke back in 1861. He described the device at the time, commenting that it had no practical value. Actually what Dr. Quincke found then was an anology between the behavior of sound in air and a hydraulic fluid in a tube. For air waves this is described in our old physics text as "destructive interference." If one branch of a tube is equal to a wave length of the sound in question and if this is connected with another branch longer by 1/2, 3/2, or 5/2 of the wave length, the resulting wave mixture will cancel out the pulsation. After all these years the aircraft industry has found a way to employ this simple device to eliminate the annoying and destructive effects of high pressure hydraulic pulsations.

Small Cars

We have talked about small cars for some time. We might as well admit now that we have known for a long time that machine tools for small car engines had been delivered last year. We also know that releases for parts from some suppliers were made several months ago. Yet we can't say with any assurance that small cars will be launched this year. Management of the big three producers still has to decide how much they can rely on market analysis. The feeling is that the size of the market has yet to be demonstrated, that is a market big enough to justify drastic action. Actually none of the investment made to date is in jeopardy even if the programs were to be delayed or scrapped. We feel sure that each organization can bank on shipping tools and parts to some other part of the world for launching a new model overseas.

Large Numbers

A recent copy of Ethyl News has an engrossing article on numbers, stemming from the conception of the "googol"— 10^{100} which was coined by Dr. Edward Kasner some years ago. A million, which is about as much as we can comprehend is 10^6 ; nonillion is 10^{30} ; quindecillion is 10^{48} ; novemdecillion is 10^{49} . Only a few quick steps take us right up to the googol, which is for the mathematicians.

Stainless Steel

We are told that airframes of certain military aircraft of advanced type will consist entirely of stainless steel honeycomb and stainless steel outer skins. If that is true, it may well strain present facilities for producing honeycomb; and maybe strain mill facilities as well.

Steel Strike

The automotive industry has gone through a lot of vicissitudes in labor problems this season. This was particularly so in Chrysler's case. Yet despite the long layoffs and the shouting on the part of UAW about unemployment there now looms a steel strike. We have no inside dope but we found in visiting a number of plants that every effort is being made to stockpile steel in advance. Unfortunately, no plant has enough storage space to tide over a long strike. The glass strike is a good example of what happens.

(Turn to page 66, please)

NEW

PRODUCTS AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card at back of issue.

Corrosion Inhibitor

Du Pont AFA-1, a corrosion inhibitor for use in aviation gasolines, is available from E. I. Du Pont de Nemours & Co. The product is expected to find wide use in aviation gasolines due to its high effectiveness at low dosages. It is said that four pounds per 1000 barrels of gasoline is sufficient to prevent corrosion.

Containing about 5.3 percent phosphorus by weight, the additive has a low ash content.

Circle 75 on postcard for more data

Fuel Injection Pump

Series 5501 rotary-vane, positive displacement fuel pumps are designed principally for fuel injection applications in the Diesel and automotive fields.

The pump has a fixed pressure type relief valve for maintaining constant pumping pressure to the engine. Rated capacity is 200 gph, with a discharge pressure range of up to 20 psi. Weight of the pump is 1.8 lb.

Designed for simple mounting, the pump is equipped with an 11-tooth



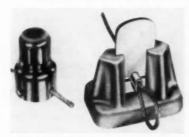
spline or a ¼-in. square drive tang. It can be supplied with either a rotatable or square mounting flange for standardization on various types of engines.

It can be used as a supply pump, where regulated pressure is important, or as a transfer pump. *Titan Pump and Engineering Corp.*

Circle 76 on postcard for more data

Assembly Tool Kit

The Bergen Cut'n Swage Kit offers a simple practical method for handling steel cable in industrial applications. It requires only a hammer for easy cutting of steel cable and



assembly of fittings. The kit consists of a Bercut cutting tool for 1/16 to 3/32 or ½-in. cable, and the Berloc swaging tool with dies in three sizes to fit the same cable dimensions. Compression sleeve fittings are used, so that the swaged assembly has the full breaking strength of the cable.

To operate the tool, cable is fed through the smallest possible hole and the cutting punch inserted above. A blow with a hammer cuts the cable cleanly and easily, without unraveling ends or leaving loose wires. Bergen Wire Rope Co.

Circle 77 on postcard for more data

Flowmeter System

High accuracy in measuring fuel flow in reciprocating aircraft engines as well as small turbo-prop and small jet engines is possible with a miniaturized mass flowmeter system.

The system measures the actual mass of fuel passing into the engine rather than its volume, which may vary with changes in temperature, pressure, and variations in such fuel properties as density and viscosity. Consisting of two basic components, a transmitter and indicator, the system provides continuous indication of the mass rate of fuel flow up to 1200 lb per hour. System weight is under 4 lb, and the transmitter is about the size of two packs of cigarettes.

The flowmeter transmitter will

withstand severe mechanical abuse such as vibration and a wide range in temperature—minus 65 to 300 F. The system operates on 115 volt, 400 cycle power. General Electric Co.

Circle 78 on postcard for more data

Electronic Potentiometer

A continuous voltage stabilizer that eliminates batteries, standard cells and standardizing mechanisms will be incorporated in circular and strip chart electronic potentiometers by the Brown Instruments Div. of Minneapolis-Honeywell Regulator Co.

The unit is said to accurately regulate the d-c reference voltage supply to the measuring circuit, making standardization unnecessary.

The stabilizer has a power supply consisting of a transformer, rectifier and filter and a regulator with temperature-compensated output.

Circle 79 on postcard for more data

Hydraulic Motorpump

This motorpump incorporates two miniaturized components — the miniature hydraulic vane pump and a three-phase electric meter. Total weight is 5.3 lb and the unit is approximately 100 cu-in. in size. Operating pressures vary from 0 to 1000 psi at temperatures ranging from —65 to 225 F. The 9 oz pump can be manifolded with servo valves, hydrau-



lic motors or fhp electric motors. The small-size, low-weight characteristics enable many ground and airborne applications. Vickers Inc.

Circle 80 on postcard for more data

MACHINERY INDUSTRIES

(Continued from page 41)

not capitalized is set up for comparison; and floor space is evaluated in dollars. Property tax and insurance are determined from a chart supplied by the comptroller; normal maintenance is estimated; special work, including major adjustments and experimentation, is evaluated; and sub-contract losses are figured for the existing machine.

A calculation is also made to determine next year's capital cost of retaining present equipment. This includes the estimated decline in salvage value. It also includes estimating the cost of restorative repairs, if required, divided by the number of years of prolonged life, plus six per cent, to obtain the repair cost for one year. Adding the year's increased (as compared to the new machine) operating costs to these capital costs gives the yearly comparative-cost for the existing machine.

In arriving at the comparativecost for the proposed new equipment, three major factors must
first be established: (1) the installed cost of the new equipment;
(2) its service life; and (3) its
terminal salvage value. The latter
two must, of course, be estimated.
Service life is considered to be the
number of years the new machine
will turn out satisfactory work at
competitive prices. The terminal
salvage value is the approximate
market value of the new machine
at the end of its primary service
life.

Allis-Chalmers, in making this (new machine) portion of the analysis, uses the MAPI graph chart to provide the obsolescence-deterioration factor for the new machine. This factor is in the form of a percentage which is applied on (and added to) the installed cost of the new machine.

When these two sets of figures are accumulated they represent the total "adverse" costs for both the existing machine and the proposed new equipment. By deducting the latter from the former, the cost

of not replacing the capital equipment is indicated (or, expressed another way, the next-year gain from replacement is indicated).

Around the Industry

National Acme Co.—A. C. Densmore, formerly field engineer, was recently made manager of the company's office at 14235 Puritan Ave., Detroit, Mich.

National Machine Tool Builders' Association — Nelson P. Bashor, director of Electrical Controls Div., W. F. & John Barnes Co., is the new chairman of NMTBA's Electrical Standards Committee. Other new appointees to the 1958-9 committee are: N. A. Anderson, Grinding Machine Div., Norton Co.; R. W. Dean, Niagara Machine & Tool Works; L. S. Inscho, Pratt & Whitney Co., Inc.; Jack North, Micromatic Hone Corp.; and K. F. Smith, The Foote-Burt Co.

Brown & Sharpe Mfg. Co.—has purchased Howe & Fant, Inc., of East Norwalk, Conn., makers of turret drilling machines and jigless work-positioning tables. The new subsidiary will be known as the Brown & Sharpe Turret Drilling Div., Inc. Arnold Charlat, former vice-president and chief engineer, is its president, succeeding A. S. Howe, Jr., who will continue as a director.

AUTOMATION NEWS REPORT

(Continued from page 40)

or ultrasonic transmission line.

Ir one application, where eight machining stations are mounted on the table of a standard machine, eight different operations are conducted simultaneously on as many workpieces. In addition, up to eight different operations can be performed on the same workpiece by moving it through each station.

MICRO-PATH CONTROL

A simplified system for controlling machine tools that combines point-to-point and continuous-path positioning control has been developed by Micro-Path, Inc., Inglewood, Calif.

The new device, known as Micro-Path Control System, records machine tool movements directly on magnetic tape without the use of expensive computer programming equipment. When the tape is played back, Micro-Path issues commands which duplicate each machining step, exactly as recorded, the company said.

The basic system can be applied to almost any machine tool, the company said, and can also be used in a wide variety of other control applications, such as transfer mechanisms, valve positioning, switch positioning, industrial drones, telemetering controls, etc.

LOW-COST COMPUTER

Bendix Aviation Corp. announced a "major price break" in data processing with the introduction of an accessory that will add punchedcard data-processing capabilities to its G-15 digital computer.

The complete system consists of a G-15, the new accessory called the CA-2, conventional readers and punches, plus a tabulator. It will lease for about \$2500 a month, which is half the rate for other systems with the same capabilities, according to Maurice W. Horell, general manager of the Bendix Computer Div.

Horell said the new equipment "will enable smaller businesses, as well as present users of computing equipment, to obtain a compact, low-priced punched-card computing system with the same performance and versatility as medium-priced systems."

The CA-2 serves as a link between the G-15 and conventional punched-card and tabulating equipment. It can process standard cards punched with numeric, alphabetical, or special character information.

"In addition to initial economy, power requirements are one-third less and the equipment installation area is about one-half that of other systems," Horell added.

By William F. Boericke

Steel Production Zooms Upward

By mid-February new orders for steel were coming in at a phenomenal rate. Barely a year ago the industry was operating at less than 50 per cent of its then capacity of 140.7 million tons. Now it is up to about 80 per cent of its new annual capacity of 147.6 million tons. It is likely that the upsurge in new orders now being experienced will push the operating rate even higher over the balance of the first half of the year. January orders were the highest received for any month for three years, said a Bethlehem executive.

The principal cause for the rush to get on the order books is the growing apprehension of a strike next July. A poll of some 30 major steel buyers disclosed that 90 per cent of them expected a work stoppage that might last one to three months time. A settlement would almost inevitably bring higher prices for steel, as much as \$4 to \$10 per ton. Plain business prudence dictates building up inventories while there is still time.

Inventories Being Built Up

Not to be overlooked as a factor in the near panic buying is the sharp reduction in inventories that occurred in 1958, which brought them down to levels considerably less than normally would be considered safe. As long as steel was in ample supply, consumers were in no hurry to replenish their stocks. They awoke to the danger of their position when the automobile makers, encouraged by the good reception for their new mod-

els, began to order flat rolled steel in increasing amounts, and the rush to buy began to snowball. So strong has been the demand that marginal facilities at some mills are being used to hike output of certain badly wanted types of steel.

However, demand is not uniformly insistent. Orders for the heavier types of steel, such as structurals and plate, have been relatively slow in contrast with the call for flat rolled products, galvanized sheets, tin plate, and hot rolled sheets and strip. Oil country goods and line pipe are improving slowly along with the long depressed wire products.

Steel service centers are well stocked for a strike, with inventories a third larger than in 1956. In case of a strike they are better equipped to assist consumers.

Reports conflict on business in stainless steel. Some manufacturers are doing very well, others report indifferent demand. There has been no shortage of nickel. Silicon electric steel is reported to be stronger than stainless, and the demand for tool steel continues to grow. Even the depressed scrap market has a firmer tone.

Cobalt Price Reduced

Inflation has not yet reached cobalt. The price was cut 25 cents a pound, effective February 1, from \$2 to \$1.75 a pound. The reduction was intended to increase cobalt consumption. The metal has been in over-supply and thus far new markets have failed to develop in spite of valient efforts by the Cobalt Institute, sponsored by domestic and foreign producers.

Copper Holds at 30 Cents

Producer and smelter prices for copper are once more on a parity at 30 cents a pound, but in London the metal has shown weakness.

After selling higher than the New York market by as much as 21/2 cents a pound it retreated to the 29 cent level. The decline in London resulted from arrival of Rhodesian and Canadian copper following the end of the strikes. However, backwardation has virtually disappeared and 90-day copper is presently offered at the same price as spot metal. There is little fear that the lower price in London will affect New York. A 2-cent differential is normal between the two markets to pay for tariff and charges. Imports into this country are necessary to supplement domestic mine output plus primary scrap and obviously the London price must decline sufficiently to permit this or New York must advance enough above London to make imports profitable.

Domestic Stocks Are Low

In this country refined stocks of copper are uncomfortably low and equal to no more than a three-weeks supply. On the other hand, domestic mine production has sharply increased and is now within close reach of deliveries, which totalled about 114,000 tons in January. But it appears unlikely that mine output can be pushed any higher as practically every copper producer is working at capacity.

Mill Fabricators Advance Prices

Following the advance to 30 cents a pound by the primary producers quotations for mill products were hiked by captive fabricators and independents quickly followed suit. While business has improved measurably for the fabricators they are still harassed by imports of low priced foreign mill products. This is likely to be a restraining influence on any move

by the producers to raise the price of primary metal further. Price stability is being emphasized as never before if copper is to hold its place in its traditional markets against inroads of aluminum and other competing materials.

Aluminum Production Curtailed Below Capacity

While aluminum production continued at a high rate at the year end it is unlikely the pace can be continued. This is borne out by decision of the principal producers to cut output. Early in February Kaiser Aluminum cut out the second one of its eight potlines at its Meade plant in Washington to permit the plant to adjust its inventories of primary metal. Aluminium Ltd. cut back 10 per cent to 500,000 tons a year in Canada and Alcoa dropped a potline in Tennessee. This quite definitely reflects an increasing and excessive primary aluminum capacity arising from the entrance of two new producers into the field. Near elimination of outputs to the Government this year has not helped.

The sharp need for increased sales to support new production facilities was vividly shown in the dramatic struggle between Alcoa and Reynolds Metals to acquire control of British Aluminium, the leading factor in the United Kingdom for sale of aluminum products. It is admitted in the trade that the domestic market is highly competitive.; Imported aluminum is being offered as much as 11/2 cents a pound below posted prices, and independent fabricators are reported to be able to get sizable concessions from primary producers in consequence.

Lead Price Declines

Toward the end of January lead was cut one cent to 12 cents a pound. The reduction had been anticipated for some time because of the wide spread of 4 cents between the markets in New York and London. Normally the differential should be between 1½ and 2 cents to compensate for the tariff plus shipping and insurance charges. Failure of the barter program and continued heavy production abroad were blamed for the price weakness in London.

As usually happens in the metal markets, lead buying declined after the price cut. Wary consumers retreated and anticipated further weakness. Demand which had been light before the cut was announced tapered off even more. Weekly sales have recently been the lowest for years. The industry has had to face unfavorable statistics. World deliveries of lead were off over 90,000 tons in 1958 and stocks held by domestic producers increased nearly 150,000 tons at the year end. Domestic mine output declined 21 per cent from the 1957 total and was the lowest since 1949. The largest declines in shipments have been in lead pigments, tetraethyl compounds and in lead for cable sheathing. Lead for battery manufacture was off only moderately.

Galvanizers the Main Prop for Zinc Market

Zinc demand has been no more than fair. There has been a good call for Prime Western from the galvanizers but demand for the Special High Grade metal from the diecasters has been disappointing and reports persist of sharp price discounts. While the market holds firm at 111/2 cents per pound, East St. Louis, the price of futures on the New York Commodity Exchange tells a different story with the March position quoted at less than 101/2 cents. Business has been routine but there is considerable belief that definite improvement lies ahead.

Tin Strengthens

The tin market has hardened considerably. Manufacturers of tinplate have been asking for more metal to keep up with the heavy demand for their product from customers who are fearful of a shortage that would follow from a steel strike. World prices have advanced following official Russian assurance that exports would be limited in 1959. It is quite probable that the present price of tin of \$1 per pound will hold and might even advance. Bolivia is slated to barter 5000 tons of tin for United States goods. The sale has been arranged so as to raise capital for the critically depressed mining industry of that country.



Some Government experts are pointing out that Russia with its expanding basic industries (steel, oil, machine tools, and chemicals) presents an even more dangerous threat to the U.S. in Europe that it does in the so-called underdeveloped countries of Asia and Africa. If European markets become dependent upon Soviet exports of these goods, they say, the U.S. will be facing a new kind of economic warfare. withholding supplies," says one expert, "by capriciously raising prices, or by dumping commodities, the Soviets in effect will have a seat at the council table of the great industrial nations of Europe."

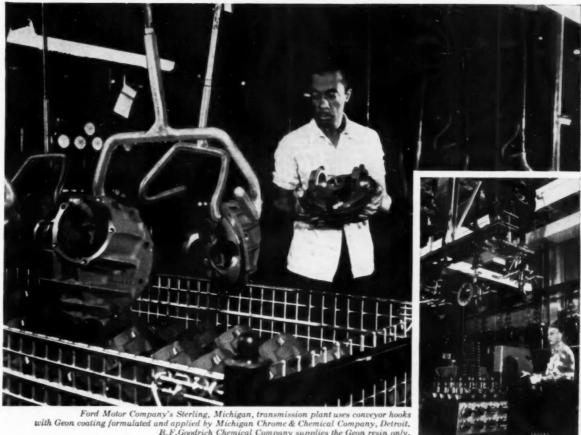
Eisenhower Administration is losing ground in its bid for congressional endorsement of a 1½ cent gasoline tax hike. The feeling is growing especially among House members, that the most helpful action Congress could take would be to prohibit diversion of Federal gas taxes to non-highway projects.

Federal Reserve Board Chairman Martin is having a hard time with congressional critics, union officials, and others favoring hard money. He insists that inflation is still the nation's number one economic problem. Therefore, he reasons, there can be no softening of interest rates until inflation slows.

Among the signs pointing toward more inflation as he sees them: Upward price pressures and cost pressures, both in industry and consumer goods; clear threat of still higher labor costs; and public's growing realization that inflation is becoming a permanent factor in the national economy.

Defense Secretary McElroy has borne much unjustified criticism in silence. But now he's beginning to fire back at those who take potshots at him. Another new development using

B.F.Goodrich Chemical raw materials



B.F.Goodrich Chemical Company supplies the Geon resin only.

"Soft touch" of Geon safeguards parts quality

The overhead conveyor system in this automatic transmission plant uses 26,000 hooks coated with Geon polyvinyl material. The soft yet durable coating made from Geon protects finished parts while they are carried from machining to assembly stations.

In addition to giving the hooks a long and profitable service life, the Geon coatings come in any color, permitting color-coding for multiple conveyor operations.

Versatile Geon is ideal for many

coating applications, since it disperses readily in the coating formula. Geon can be used to coat paper, textiles, metals or almost any material to provide new or improved advantages. Hundreds of types of Geon resins, plastics, latices and polyblends are available, tailored to specific uses for coatings, moldings, extrusions, or rigid or foam applications. For information, write Dept. Aq-1, B.F. Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.



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Report from the

HILE it was generally conceded that 1958 would be a good year for the farm equipment manufacturer, the figures just coming in for fiscal 1958 indicate that for some of the largest farm machinery makers the year was an all-time record breaker. The picture in the case of Allis-Chalmers Mfg. Co., International Harvester Co., and some others is somewhat confused because these companies have widely diversified product lines, but good business seemed to be the rule among all the agricultural equipment makers.

Deere & Co. reported recordbreaking sales of \$472,612,788 for 1958 fiscal for its American and Canadian operations, and world-wide sales of \$509 millions for the same period, also a record. President William A. Hewitt pointed out, however, that net income was below the 1950 figure, with \$42,-067,809 for 1958 and \$42,756,901 for 1950. Significant, too, was the fact that it had required 54 per cent more sales and 70 per cent more total assets to produce the 1958 net than the 1950 income.

International Harvester Co., reporting for its farm equipment and farm tractor activities separately, found 1958 a very good year, but not record-breaking saleswise. Fiscal 1958 produced \$391,267,000 in sales of farm implements and trac-

FARM EQUIPMENT INDUSTRY

By Kenneth Rose

tors, parts and services, compared with \$435,592,000 in 1951 fiscal. The 1958 figure was up 2.5 per cent from 1957's \$381,660,000.

The six-week strike at Harvester plants has left the company with a large backlog of orders, officials say.

Allis - Chalmers Manufacturing Co. announces a new 80-R rearmounted mower characterized by a welded channel steel frame of great strength and rigidity. Six and seven-ft cutter bars are available. This is a modification of the No. 7 mower introduced about two years ago.

Oliver Corp. reported total sales of \$113,328,126 in fiscal 1958, up 11.5 per cent from 1957's \$101;-678,450. Of this total, \$78,030,800 was from sales of farm equipment in the United States and Canada, and this was reported to be the highest for the company since 1952.

Oliver Corp. has announced a two-way, roll-over type plow, its Model 6240, convertible into four different sizes. The two-bottom frame is convertible to three-bottom size. It can be used with two 14-in. or two 16-in. bottoms, or with three 14-in. or 16-in. bottoms. Offered with a choice of springtrip or rigid beam, with independent hydraulic control for lift and rotation, the plow's close coupling provides stability and facilitates small space maneuvering.

Two new tractors, Models 880 and 770, have been brought out by Oliver Corp., the former of 64 belt (Turn to page 63, please)



New Diesel tractor introduced by Ford Motor Co. Identical with the Ford Workmaster tractor in all respects except fuel requirements, its engine has a displacement of 144 cu in. and a compression ratio of 16.8 to 1.



The Allis-Chalmers Model 80-R rearmounted mower

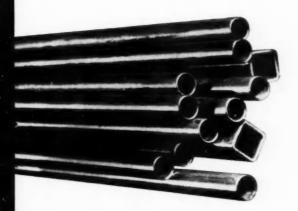


New Wheatland tractor announced by Oliver Corp.

"Whom do I call for mechanical tubing?"



"Why, your USS Shelby Distributor, of course!"



When a steel tubing problem confronts you, get in touch with your Shelby Distributor. His ideas, experience and engineering know-how will prove most valuable.

Your Shelby Distributor carries a complete stock of USS Shelby Seamless Mechanical Tubing—round, square, rectangular, or other special shapes in commercial sizes from 1/4" OD to 103/4" OD.
Wall thicknesses from .035" to 2.000" in a wide range of steel grades and anneals.

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· · INDUSTRY STATISTICS · ·

WEEKLY U. S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

Weeks Ending Year to Date

	*****	re winning		
Make	Feb. 21	Feb. 14	1959	1958
PASSENGE	R CAR	PRODUCTION	1	
Total - American Motors Corp	8,409	6,921	58,242	27,470
Chrysler	921	945	8,485	9,447
De Seto	863	844	6.671	6,556
Dedge	1.940	1,751	15,215	14, 135
Imperial	542	521	3,224	2,743
Plymouth	1,407	84	29,913	58,100
Total—Chrysler Corp.	5,673	4,145	63,518	90,989
Edsel	729	1,045	8,996	2,834
Ford	33,266	30,938	229,260	190,358
Ford	692	458	5,439	5,812
Mercury	3,780	3,058	28,152	22,786
Total-Ford Motor Company	38,467	35,499	271,847	221,787
Buick	6,589	7,301	56,291	58,226
Cadillac	3,811	3.727	27,904	23,034
Chevrolet	34,715	35,035	257,371	246,463
Oldsmobile	9,145	8,870	67,788	67.526
Pontiac	9,587	9,727	67,595	51,339
Total-General Motors Corp.	63,847	64,660	476,949	444,588
Packard Studebaker	4.339	4,326	27,830	804 4,381
Total Studebaker-Packard Corp.	4,339	4,326	27,830	5,165
Checker Cab	104	100	1,008	506
Total—Passenger Care	120,919	115,720	897,394	790,513
TRUCK AN	D BUS	PRODUCTION		
Chevrolet	8,365	8,480	59,857	43,295
G. M. C.	1,752	1,737	13,328	9,616
Diamond T	166	155	973	852
Divos.	70	70	504	444
Jodge and Farge	1,928	1.818	13,046	7,853
ord	6,329	6,009	46,947	37,671
. W. D.	30	17	151	211
nternational	2.817	3,173	14,714	19,047
Mack	354	354	2,521	2,140
tudebaker	377	369	2,443	1,449
Vhite	369	369	2,536	2,939
	2.395	2,245	16,055 435	12,254 466
Willys		67.73		400
Willys Other Trucks	60	24 858	173 510	138 227
Willys Other Trucks Total—Trucks	25,010	24,856	173,510	138,237
Willys Other Trucks	60	-	173,510 275 1,071,179	138,237 556 929,306

1958 TRUCK TRAILER SHIPMENTS

Industry Division, Bureau of the Census

		Twelve Months			
Type of Trailer	December	1958	1957		
Vans Insulated and refrigerated	284	3.453	4,497		
Steel	15	337	596		
Aluminum	269	3,116	3.901		
Semi-insulated	23	513	676		
Steel	-		119		
Aluminum	23	513	557		
Furniture	88	1,468	1,563		
	73				
Steel	15	1,468	1,563		
All other closed top	2.296	18,166	20,935		
Steel	789	6.072	9,259		
Aluminum	1.507	12.094	11,676		
Open-tep.	235	2,366	3, 191		
	65	1.009	1.585		
Steel	170	2,132	1,606		
Aluminum	170	2,132	1,000		
Total-Vans	2,926	25,966	30,862		
Tanks					
Non- and low pressure					
Petroleum	000	0.200			
Carbon and alloy steel	206	2,326	14.001.8		
Stainless steel	23	225	0.111.12		
Aluminum	161	1,453	444939		
Total-Petroleum	390	4,004	4,664		
Chemical, food, fluid solids	39	545			
All other, incl. aircraft refuelers	27	415			
High Pressure (LPG, chemicals, etc.)	41	350			
Total—Tanks	497	5,314	6,325		
Pole, pipe and logging					
Single axle	27	325	519		
Tandem axle	43	567	709		
Total	70	892	1,228		
Platforms					
Racks, livestock and stake	22	149	2,718		
Grain bodies, all types	133	1.079	1,341		
Platforms (flats), all types	667	6.329	6.654		
	000	-	40 740		
Total—Platform,	822	8,657	10,713		
Low-bed heavy haulers	163	2.335	2,884		
Dump trailers	124	2.426	2.070		
All other trailers	313	2,156	3,608		
Total-Complete Trailers	4,915	47,746	57,690		
Trailer chassis ¹	269	3,242	4,406		
		Barriero -			
Total—Trailers and Chassis	5.184	50.988	62.096		

1958 NEW REGISTRATIONS

Based on Data from R. L. Polk & Co. and Dept. of Motor Vehicles, State of Oregon

Arranged in Descending Order According to the Twelve Month 1958 Totals

	NEW PA	SSENGE	R CARS				NE	W TRUC	KS		
	Danamhar	Managhan	Occamban	Twelv	e Months		Davambar	Necesian	December	Twelve	Months
Make	December 1958	November 1958	December 1957	1958	1957	Make	December 1958	November 1958	December 1957	1958	1957
Chevrolet	132,585	61,950	140,103	1,233,623	1,456,288	Chevrolet	26,571	15,222	20,350	247,191	290,960
Ford	123,710	94,849	129,800	1,028,300	1,493,617	Ford	21,719	17,831	18,781	208,489	277,301
Plymouth	31,728	27,603	37,425	390,832	595,503	International	7,607	7,461	7,534	89,690	96,956
Oldsmobile	37,024	20,011	36,156	306,533	371,596	G. M. C	5,621	4,571	4,476	55,873	62,165
Buick	32,970	21,413	36,217	263,890	394,553	Dodge	4,176	2,742	4,250	36,976	49,431
Pontiac	30,670	15,006	26,064	229,742	319,719	Willys Truck	2,012	1,622	1,473	14,860	15,327
Rambler	23,898	19,888	9,272	186,222	91,469						
Mercury	13,848	7,127	14,886	136,139	260,573	White	1,041	1,195	837	12,148	14,558
Dodge	11,138	11,001	15,604	135,494	257,488	Mack	989	838	1,022	11,862	13,312
Cadillac	14,498	5,935	13,323	122,549	141,209	Willys Jeep	1,115	888	868	7,650	6,678
Chrysler	4,556	3,535	7.717	58,537	106,436	Studebaker	364	276	408	4.119	6.547
De Soto	3,692	3,282	6,840	47,864	103,915	Diamond T	230	242	312	2,930	3,472
Studebaker	9,779	5.057	4,501	47,744	62,565	Divce	149	191	125	2.164	2,558
Edsel	4.535	3,321	5,531	38,488	26,681						
Lincoln	2,841	1,633	3,638	26,538	37,298	Brockway	108	99	58	959	738
Imperial	1.514	1.041	2,423	14,807	33,017	Kenworth	64	75	44	860	1.006
Metropolitan	910	956	780	12,336	11,791	Peterbilt	17	30	26 27	416	497
Packard	74	77	217	2,580	5,189	F. W. D	32	29	27	381	433
Misc. Domestic	563	351	774	3,508	18,399	Misc. Domestic	85	70	93	915	884
Foreign	36,773	34,835	20,865	365,222	195,036	Foreign	2,834	2,564	1,676	28,320	15,262
Total-All Makes	517,304	338,881	512,136	4,650,948	5,982,342	Total-All Makes	74,734	55,928	62,160	725,803	858,085

Timken-Detroit "3 for 1" Axles Are First Choice With Big Fleet Operators!

These superior features make the difference:

Interchangeability of Three Final Drives. Single-Speed Single-Reduction, Single-Speed Double-Reduction or Two-Speed Double-Reduction final drives using the same housing, hubs, drums, brakes and axle shafts gives your vehicles unmatched flexibility. Parts are readily available and less expensive.

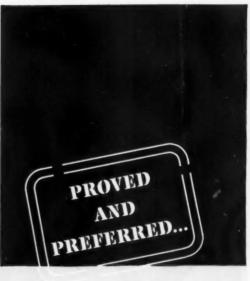
Hypoid Gears. Larger pinions and greater tooth contact give 30% more torque capacity, top efficiency and long life ... plus lower maintenance costs.

True Double Reduction. Two full size gear sets, one for each reduction, provide huskier gears and a balanced distribution of effort. Gears and bearings last longer and need less maintenance.

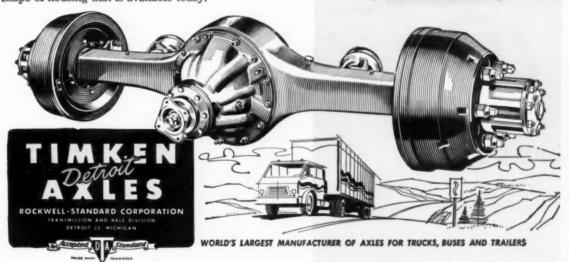
Torsion Flow Axle Shafts. More splines, plus greater root and body diameter, add extra strength.

Famous Time-proved Differential. Extra-strong gear body and teeth, plus hot-forged trunnion, give long trouble-free operation even under the roughest kind of treatment.

Hot-Forged Steel Axle Housing. The rectangular form of these high carbon steel housings is the lightest, strongest shape of housing that is available today.



Timken-Detroit® Axles are the Accepted Standard!



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Construction of the X-15 manned space research plane will involve the combined team effort of more than 300 firms, large and small, located in every section of the country.

A gas-driven hypersonic gun capable of speeds up to 13,500 mph will be built by a U. S. aircraft company to research atmospheric re-entry problems of manned space vehicles.

Latin American countries are the largest importers of U.S. made motor vechicles.

Of the 335,785 units sold abroad during 1957, the largest number went to Mexico — 18,559 cars, 20,080 trucks, and 1445 buses, for a total of 40,084.

Venezuela led in passenger cars with a total of 19,709 imported. Brazil received the largest number of trucks—27,134.

In Europe, Belgium and Luxemburg were the biggest U.S. automotive customers with 15,746 imports.

Canada bought 22,895 vehicles from the U.S., the Belgian Congo 5038, and India led Asian nations with 7409 U.S. imports.

Almost every other car on the road in the U.S. today has an automatic transmission.

The number of automatic transmissions in use has increased on an average of 10 per cent annually since 1952.

Last year, 84 per cent of new cars sold were automatic. By contrast, 92 per cent of U.S. passenger cars had manual shifts in 1946.

At Mach 20, shock waves in the air might reach a temperature of 7000 C, hotter than the surface of the sun.

Straight Line Setup for Automated Heat Treating

(Continued from page 37)

loading the furnace with fresh work while the previously tempered load is being further cooled in the same atmosphere as used in the furnace.

Most of the work is tempered in a 1050-1200F range. Use of a DX generator gas atmosphere not only eliminates scaling at these temperatures, but produces an acceptable surface finish without the need of blasting operations.

One man operates all of the heat treating facilities in this particular straight line arrangement. This is accomplished primarily by means of a shuttle-buggy, which the operator actually rides. The buggy rolls on two floor rails installed over the full length of the heat treating line.

Trays are loaded at a work station by the operator, and automatically moved on the "shuttle-buggy" as required. The operator, riding the running board of the loaded buggy conveys the load to the Super Allcase furnace. The furnace door is opened, and a transfer chain on the "buggy" charges the tray load of parts into the furnace vestibule, and the door closes. From this point on the operation is automatic—transfer to heating chamber, temperature, time at temperature, removal for quench, and

positioning for removal from the furnace itself.

At this point the transfer chain removes the load from the furnace and places it on the shuttle-buggy to be transported to the spray washer. After removal of excess quenching oil, the trays are moved to a holding rack. Here the parts are permitted to cool further for completion of metallurgical transformation, and to permit surface inspection and "as quenched" hardness checks. Several types of hardness testing equipment are incorporated in the line at this point.

After such checks the trays are again "chain transferred" to the shuttle-buggy, transported to one of the two Surface tempering furnaces, conveyed into the vestibule and again automatically processed through the tempering cycle. After tempering, the tray load of parts is automatically transferred to an overhead cooling chamber in the furnace where it is cooled below excessive scaling temperature. The loaded trays are again transferred to the shuttle-buggy and moved to the unloading station.

Complete inspection is now made on the heat treated parts and they are then shipped out to assembly or for final machining operations.

(Continued from page 27)
sile practice cally pressurized to simulate the

Making Redstone and Jupiter Missiles

In keeping with missile practice all welds are X-Rayed to make sure they are sound. X-Ray inspection is performed with a light weight portable unit, having a rating of 125,000-volts. All welds are certified before the shell is subjected to hydrostatic stress testing.

One of the unusual features of this facility is employment of a 60-ft steel tower for testing missiles under simulated dynamic loading and pressure conditions encountered in actual firings. During this test each missile is filled with a suitable liquid to simulate the density of the lox and fuel. Fuel tanks also are hydrostati-

pressures in flight. There are many other unique testing devices. Among the more important are: a vertical test stand in the laboratory which moves like a pendulum to simulate the conditions of pitch experienced in flight due to wind force. Instrumentation is provided to check on the behavior of control stabilizers which correct for wind force effects during flight; a vibrating "shake" table that duplicates the vibrations experienced during launching; a centrifugal test machine, mounted in a pit, designed to impress loading up to 100-G on components; a coneshaped furnace lined with infrared lamps to study the effect of high temperature on nose cones during re-entry; an electronic system for determining the center of gravity of each missile, by components and for the assembled missile.

In addition to the illustrations shown here, it is of interest to note that giant spider type welding fixtures are employed for welding ribs onto Jupiter sections ahead of circumferential welding. Spot-welding for this purpose is handled by outsized Sciaky welders. Another noteworthy item of equipment is a large Cyril Bath draw forming machine which is used for making a variety of ribs and other elements of the ballistic frame.

Report from the FARM EQUIPMENT INDUSTRY

(Continued from page 58)

hp rating, the latter of 51 belt hp, both with choice of Diesel, LP gas, and gasoline fuels. These new Wheatland models feature lowest practical center of gravity and widest possible wheel treads with short wheelbases for maximum maneuverability, 83 in. and 81 15/16 in. Power steering is available as optional equipment. The 880 model is equipped with 15-30 rear tires, with tread of 581/4 in. that can be changed to 541/4 in. by reversing the rims. Model 770, with 14-30 rear tires, has a 565% in, tread reducible to 52% in, by reversing the rims. Front wheel tread is 52 in. on both models.

An arched axle bed gives additional front-end crop clearance. The tractors can be driven over obstructions as high as 16 in. Both models will be built at Charles City, Ia.

Two other pieces of equipment to be introduced by Oliver for the 1959 season are a two-row corn harvester, the Model 73, adaptable to farm operations in which both ear corn and shelled corn are desired. Interchangeable husking and shelling attachments are provided. Eight husking rolls, four of cast iron and four rubber surfaced, with a high velocity fan for cleaning, are part of the unit.

Behlen Delivers Heavy, Bulky Loads Promptly... Using The Spicer Presto-matic



Behlen buildings are unique. They incorporate the firm's own frameless metal design and utilize many new developments to obtain a wide variety of applications. The design incorporates a system of channel ridges, or deep corrugations, to give unusual rigidity to metal panels and make possible great strength.

Almost cat-like agility — that's what Behlen Manufacturing Company's powerful Diamond T 923 F's need, in order to thread their way in and out of construction sites. Only the most dependable equipment can be considered — for the Behlen building business is booming, and split-second delivery schedules are absolutely necessary. Down-time is out!

That's why Behlen ordered the Spicer Presto-matic Truck Transmission System in their newest purchase from Diamond T Motor Truck Company.

Presto-matic is a semi-automatic truck transmission system that takes the effort out of driving by eliminating the clutch pedal — while also providing maximum fuel economy, minimum maintenance and greater safety for driver and equipment.



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Many of these products manufactured in Canada by Hayes Steel Products Limited, Merritton, Ontario.

New Study Traces Spectacular Rise of Automobile Industry

By Samuel Cummings

AMERICAN AUTOMOBILE MANUFACTURERS: The First Forty Years

By John B. Rae. Illustrated. 218 pp. Philadelphia: Chilton Co. \$6.00

It is surprising when you consider the tremendous impact of the automobile industry on the quality and pattern of American life, how few books there are on the subject. Outside of a few biographies on such major figures as Ford, Durant, and Chrysler; a few memoirs by some of the industry's lesser men; and some histories, not much has been written of a formal nature to excite the curiosity of the general reader.

A definitive history of the men whose inventive genius, technical know-how, and organizing ability created the automobile industry still remains to be written. This excellent and readable treatise by John B. Rae, associate professor of history at the Massachusetts Institute of Technology, undertakes that task for the period beginning with the founding of the industry in America and ending about 1935.

By the mid-thirties, as Professor Rae points out, the automobile had come of age and the broad outline of the patterns which the industry has since assumed were plainly evident. By applying the techniques of mass production to the manufacture of automobiles, innovators like Ford, Chrysler, and Durant succeeded in transforming the passenger car from a plaything of the wealthy to an article of mass consumption.

In tracing its rise from a small industry dominated by ex-bicycle and carriage makers to the vast sprawling enterprise of today, Professor Rae has a good deal to say about the pioneer technicians who made it possible, men like the Dodge and Duryea brothers, David Buick, Ransom Olds and others. These men had a passionate devotion to cars, but as the author points out, they were ill-equipped to carry on the business end of manufacturing. Although they set

the industry pace for a brief time, their reign was short-lived.

With the appearance on the scene of the businessmen and organizers and salesmen began the period of strenuous competition that reached a peak in the twenties. This was the era of large-scale organization. of mergers and reorganizations, combinations and consolidations, liquidations and bankruptcies. Companies rose and fell in quick succession; the old-style industrialists began to disappear from the scene. When the smoke of battle cleared, a few giants were left in control of the field; only a handful of independents remained.

The ascendancy of the Big Three marked the end of an era. The industrialists now in command, men like Alfred Sloane and Walter Chrysler, were an entirely different breed. They thought mainly in terms of an expanding mass market and of giving the customer what he wanted.

The times were ripe for change. The prosperity of the twenties had brought about a vast upheaval in national tastes. Customers no longer were satisfied with the unrelieved functionalism of the Model T. They wanted something better -cars with more style and variety and color-and before long a new generation of designers, engineers, and other specialists arose to meet their demands. Cars began to take on curves and more pleasing hues. They were no longer designed merely for transportation: they became articles of fashion, status symbols, part of the American dream.

All this is recounted with great skill and objectivity by Professor Rae, with major emphasis on the men whose business leadership was largely responsible for this spectacular growth. He deals frankly

(Turn to page 66, please)



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Observations

By Joseph Geschelin

(Continued from page 52)

Engine Progress

In our trips around the country recently we have noted some exciting developments in engines. For one thing, we learned that a prominent manufacturer is grooming two unusual truck engines. One of these is a V-6; the other a V-12. We find too that one of the large truck builders is tooling a machine line for converting a 6-cyl gasoline engine to a Diesel. This is reminiscent of a similar conversion made by the Ford Tractor Div. several years ago and recorded in AI. Important feature of such conversions is the ability to build both gasoline and Diesel engines along the same line with maximum interchangeability of major parts. This increases the economy of producing both types of engines.

Spinning Metals

Chipless production of large forms for missiles and airframe and jet engine components will be expedited by the development of special vertical type spin-forming machines. Lodge & Shipley has one ready for announcement; Cincinnati is grooming one for early release.

Numerical Control

A recent trip to the machine tool plants in the Cincinnati area reveals that producers of every kind of equipment are thinking in terms of numerical control. This is true of radial drills, lathes, profiling equipment, planers, special milling machines, and in fact almost anything you want to name. Numerical control comes high at the start and most of it is intended for Government projects. But the experience thus gained eventually should result in simplification and lower costs. Ultimately the tax money should result in a new generation

of machine tools for mass produc-

Foil Weld

A unique technique for an unusual application has been developed by Precision Welder. The problem is a common one in the press shops of the industry; how to salvage offal economically. The case in point, in one of the biggest press shops, is a triangular piece of offal about 18-in. long resulting from the forming of a fender. Precision has designed a special welding machine that will take two such pieces and butt weld them into a rectangular blank. The latter, in turn, is just right for making an interior stamping. Secret of this technique of butt welding body gage sheet steel is the use of "foil," hence the term "foil welding." The foil is a thin gage strip of steel placed over the seam, either on one side or on both sides.

New Study

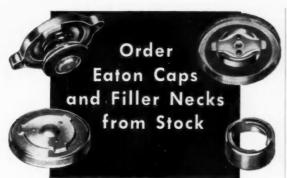
(Continued from page 65)

with the critics of the industry, who find fault with its bigness and with the manner in which it eliminated competition. His argument is a plausible one. The Big Three, he contends, is not a "result of conscious effort to monopolize; it came about in the nature of things, because mass production requires large-scale organization."

With this illuminating study of an industry which has had such a pervasive influence on American thought and folkways, Professor Rae has made a major contribution to an understanding of our times.

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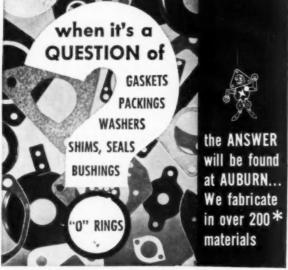
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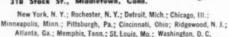


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FREE LITERATURE

Maintenance Booklet 1

A 24 page booklet designed to help solve maintenance and repair part problems covers care and trouble-shooting of machines and equipment, machining and welding techniques and contains drill hole tolerances and a grinding limits chart. LaSalle Steel Co.

V-Belt Drives

Bulletin A-695, 44 pages, describes a line of v-belt drives. Illustrated with photographs and engineering drawings, the bulletin explains the construction features of DYNA-V sheaves and v-belts. Dodge Manufacturing Corp.

Thin Wall Tubing

A bulletin on the CDF line of flexible thin-wall paste—extruded tubing and spaghetti extruded teflon is available from Continental-Diamond Fibre Corp. Complete tables of sizes and tolerances are given.

Wear-In Compound

Bulletin 120 discusses the effectiveness of Molykote wear-in compound in eliminating damage due to improper breaking-in of new or rebuilt machinery. The Alpha-Molykote Corp.

Flexible Metal Hose

Data on ways to overcome flexation and vibration problems of Diesel pipeline connections are contained in ALLFLEX flexible metal hose Data Sheet #552. Allied Metal Hose Co.

Deep Throat Presses

Minster Series 20 deep throat punching presses for light and medium cutting, punching and flanging operations on large pieces are described and illustrated in Bulletin 13. The Minster Machine Co.

Brazing Process

How To Braze Stainless Steels discusses in detail four aspects of the brazing process: characteristics of base and filler metals; brazing cycles; selecting and using gas atmospheres; construction and application of various types of furnaces. Harper Electric Furnace Corp.

(Please turn page)

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FREE LITERATURE-Continued -

Corrosion Prevention

Bulletin 93XG describes Metco metallizing systems, a series of techniques developed through the use of properly treated pure metals which are firmly bonded to a steel base by metallizing. Metallizing Engineering Co., Inc.

Finishing Equipment

Circular 512 describes a complete line of bearing-surface finishing machines for straight shafts, crankshafts, and camshafts. Included are models A, B, HD, and SFA lapping machines; models A, B, HD, DER, and SER fillet-rolling machines; and

models SF and SFB machines which can lap, fillet roll, or roll burnish. The Foote-Burt Co.

Vibration Control

Many types of vibration control mountings and materials available to solve vibration problems in industrial installations are listed and described in Bulletin IND-11. Vibration Mountings. Inc.

Carbide Data

Catalog A-102, 32 pages, contains information on carbide tools, tips, inserts and blanks. Complete performance data is included as well as information on special shapes and wear parts. Unimet Carbides

Master Reference

A brochure describing the Lear #2-Gyro all attitude master reference which is an integration of Gyro elements that produces a completely all attitude control reference for aircraft application is available from Lear, Inc.

Production Tools

A complete line of solenoid-operated impact hammers, punches, stakers and Geneva action indexing tables are described in a 12 page catalog prepared by Black & Webster, Inc.

Pneumatic Grinders

Catalog PT-58 provides data on a line of portable pneumatic grinders. The line, including both horizontal and high-speed die grinders, is designed for a wide range of industrial operations. Thomas C. Wilson, Inc.

A-C Motors

Bulletin B-2103-4 gives concise selection data to users of a-c motors from one through 200 hp. Reliance Electric & Engineering Co.

Stainless Steel Data 16

Stainless Steel Machining Data is the title of an eight page bulletin issued by Kennametal Inc. Feeds. machining speeds, and grades of carbide cutting edges best suited for roughing, semi-finishing, and fine finishing 188 compositions of stainless steel types from 201 to 502 are tabu-

Drawing Reproduction 17

Four solutions to commonly encountered problems in reproducing engineering drawings are presented in a folder by Peerless Photo Products, Inc. The solutions are outlined in detail for the reproductiondepartment operator.

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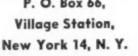
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FREE LITERATUREcontinued

Metal-Enclosed Bus

A concise bulletin designed to aid in the selection of metal-enclosed bus for utility and industrial use has been published by the I-T-E Circuit Breaker Co.

Engine Bulletin

A-12 page illustrated brochure describing the wide selection of industrial and automotive engines available in GM Diesels all-purpose power line has been released by Detroit Diesel Engine Div., General Motors Corp.

Motor Guide

Century Electric Co. has issued a 16 page, 1959 motor application guide (Form 270A). The guide lists 9 major features in motor selection.

Electric Generators

Folder F-141 describes the complete line of separate electric generators manufactured by D. W. Onan & Sons, Inc.

Bearing Lubrication

Lubrication of miniature instrument bearings is the subject of a lubrication manual released by Miniature Precision Bearings, Inc.

Gearmotor Bulletin

Bulletin 3050, covering a line of right angle gearmotors offers engineering information on gearmotor ratings of 1/3 to 30 hp, single reduction, with output speeds of 23 to 280 rpm. The Louis Allis Co.

Production Tools

Complete specifications and descriptions of Apex nut running. screwdriving and miscellaneous production and fastening tools are described in 206 pages of catalog data released by the Apex Machine & Tool

(Please turn page)

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Accessory Catalog

A four page folder lists a complete line of knobs, levers, wheels, handles, and crank handles manufactured by Machine Products Corp. All items are available in a wide variety of standard sizes.

Stacker Units

26

An electric "Walkie" stacker designed for narrow aisle operation is described in Bulletin 911. The truck has a 2000 lb capacity and operates on four six volt batteries. It has three speeds in both forward and reverse. The Raymond Corp.

Finishing Equipment 27

Catalog B-25-C, four pages, describes two small barrel models and 11 specialized barrel finishing machines along with a complete line of barrel finishing compounds and media. ALMCO, Queen Products Div., King-Seeley Corp.

Finishing Products 2

George Koch Sons, Inc. has released a 40 page catalog, "Standard Finishing Equipment Components," giving specification and performance data on its line of industrial finishing products.

Magnetic Flowmeter 2

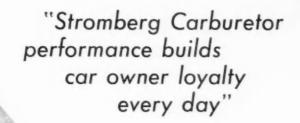
Catalog 10D1416 gives complete information on an obstructionless magnetic flowmeter for metering difficult liquids such as concentrated acids and alkalis. Fischer & Porter Co.

Aviation Clamps 3

Wittek Manufacturing Co. has issued four page bulletin AVC-159 which illustrates and describes their various stainless steel clamps for aviation hose and duct connections.

Hinged Pan Conveyors 31

Four page bulletin 58-1 describes the application of hinged pan conveyors in quench tanks, scrap movement, foundries and machined part handling. Anchor Steel & Conveyor Co.



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